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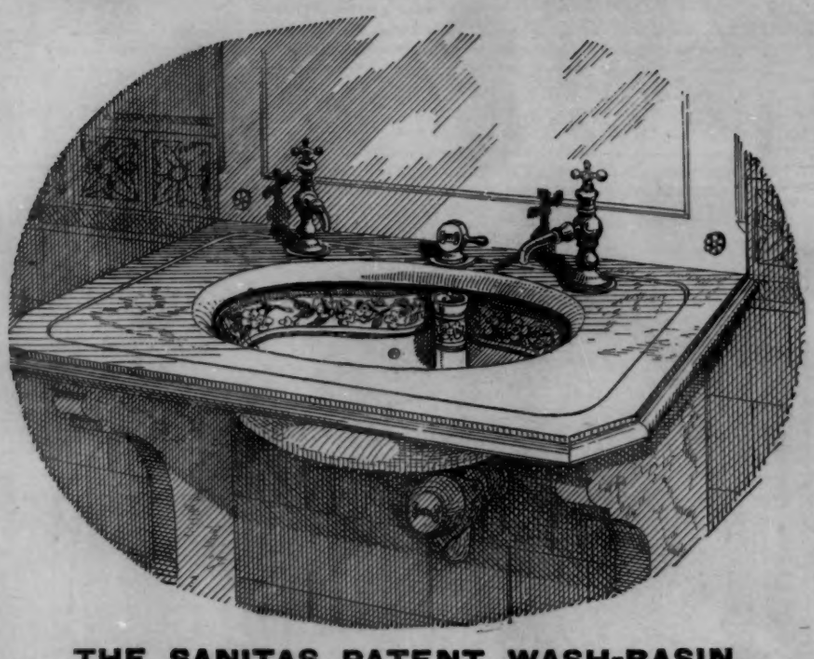
THE SANITAS LAVATORIES.

(BASIN, BATH-TUB, PANTRY-SINK.)



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WITH this number the *American Architect* opens a new department, which it is hoped will prove very useful to its readers. For a long time the editors have had in mind the desirability of maintaining a department like that which forms an important portion of the French technical journals, in which questions involving legal points should be answered, and, if of general interest, discussed at some length by a thoroughly competent lawyer. Their correspondence with their subscribers, both privately and through the columns of their journal, has shown them not only how valuable to architects and builders timely advice of this sort may often be, but how much more valuable it is if it is always ready, and is to be implicitly relied upon. The persons who can furnish such advice are by no means numerous, even in the legal profession, and the editors consider themselves fortunate in having secured the services of a lawyer not only very thoroughly trained, but experienced to an unusual degree in building cases, and familiarized with the technicalities of construction by many building operations carried on under his care, either on his own account or as trustee for others. His own introductory remarks, to be found in another column, will best indicate the character of the work which he is to do in the interest of the subscribers to the *American Architect*, and the editors need only add that they have reason to believe that the work will be well done, and that those who consult the department will receive advice which may be depended upon as having been carefully weighed, and based upon accurate knowledge of the subject.

A RESOLUTION has been introduced in the New York Legislature, directing the Supervising Commissioners of the Capitol "to make a thorough examination of the present condition of the Capitol building; to ascertain the kind and quality of materials and labor that will be required to complete the same, internally and externally, according to the plans and specifications therefor already adopted and now in force; and to make as full, accurate and detailed an estimate of the cost of such material and labor as they may be able to prepare." They are also empowered "to suggest modifications or changes in the plans for the building, or for any part thereof, making a detailed statement," with estimates of cost, in regard to any such modification, and are directed to "express their opinion as to the length of time that will probably be required to complete the building according to the plans which they may recommend," and to report in full on all these points "on or before the fifth day of February next." On the twenty-third of January the resolution was still pending in the Senate, and, if it passes there, it must go to the Assembly for concurrence, so that, supposing other business to be suspended, and the resolution pushed through with all possible expedition, the Commissioners will have, at the utmost, twelve days in which to "make a thorough examination of the building," concoct "modifications or changes in the plans," and prepare detailed estimates, not only of the cost of these changes, but of all the work remaining to be done under the existing plans and specifications. It ought to be unnecessary to say that any plans or estimates prepared under such conditions would be perfectly useless and ridiculous, but as the New York Legislature has now spent eighteen millions of dollars, in tinkering its building, year after year, on just this system, it would seem that there are some people who still need to have the lesson impressed on their minds that to employ four independent architects on the most important structure in the State, to accept, without expert advice, designs from each, which, after they have been half carried out, the others are employed to demolish and replace by something else; to leave all the architects in the dark as to what each is expected to do, and, after each has done a great deal of work which turns out to be in his colleagues' province, to appoint some one else to execute a miscellaneous mangling of the entire assortment of designs; and finally, to disgust all the architects by shabby treatment, and, finding their zeal chilled, to seek a substitute for it in a succession of commissions of all sorts, is not the way to secure either rapidity or economy in building, whatever other objects may be attained.

IT would hardly be credible that the Albany Capitol, even in its present unfinished condition, is by far the most costly building of modern times, if we had not the official statement of the expenses. The Capitol at Washington, from 1793, when its corner-stone was laid, up to 1878, had cost, including all expenses of repairs, supervision, furnishing, alterations and minor items, less than thirteen millions, and in eighty-five years of constant use all the furniture, and much of the structural part, must have been several times replaced. The Patent Office has now cost nearly as much, but this, we suppose, includes rebuilding after the disastrous fire; and the Treasury, a more expensive design than the Capitol, has cost seven millions. On the other side of the ocean, the architectural wonder of the century is the Palace of Justice at Brussels, the largest known building in the world, which covers two hundred and seventy thousand square feet, or nearly twice the area of the Capitol at Washington, with a mass of sculptured and polished marble, surmounted by a marble tower four hundred feet high. The palace stands on the edge of a precipice, so that the foundations were enormously expensive, yet the whole was finished complete for ten million dollars. Undoubtedly, building is somewhat cheaper in Belgium than in Albany, but the real reason why the people of Brussels got at least four times as much as those of Albany for about half the money is that they had sense enough to select a design carefully, to employ its author honorably, to pay him properly for his services, and to let him carry out his plan without blundering interference, and without upsetting his calculations, and those of the contractors, every few months by neglecting to make appropriations, or by letting loose upon the work a new set of commissioners with power to change everything at their own sweet will. Whenever the New York Capitol is finished, it will be inaugurated, not with the rejoicings of King and people, but with the execrations of nearly every one who has ever had anything to do with it, including the tax-payers. The various architects, who have worked harder, and brought more knowledge to their task, than any one else, have suffered most. The late Mr. Richardson, to whom, we may well say, the Capitol owes most of its fame, did some of his best work for it after his tiny salary had been cut down, by a vote of the Legislature, to a sum which would not much more than pay for the paper and ink used for the drawings. He nearly decided, as he told us at the time, to resign, but other work came in, from the proceeds of which he could pay out of his own pocket the draughtsmen who were helping him to endow the State of New York with a structure to which Mr. Freeman accords the highest praise that he bestows on any modern building. We can wish for the public and the profession, and for architecture in this country, nothing better than that such transactions may for the future be impossible in connection with public buildings. There is good reason to hope that our architects have nearly done with submitting their work, and their fortunes, to the whims of persons

who know, and care, nothing about their art, and when they have fully made up their minds in this respect, they will be in a position to demand such treatment as their brethren abroad receive in return for services no more valuable than their own.

A DECISION has just been rendered in Ohio which will, we hope, serve to encourage in the managers of trades' unions a little more decency than they have hitherto shown in regard to the means which they employ for coercing people against whom they have a grudge. A firm of contractors in Cincinnati happened in some way to offend the Bricklayers' Union. This is by no means a difficult thing to do with most trades' associations, as the income and influence of the leaders is dependent on the frequency and ferocity of the quarrels between masters and men which they foment, and, as usual, a trifling workshop misunderstanding was nursed into a struggle which was carried on for ten months, with the help of all the cowardly weapons that the modern "Knights" delight in. The first step was to induce non-union men to leave the firm's employment, and to threaten those with vengeance who should take their places. This was followed by appeals to persons who had contracts with the firm to break them, and to dealers to refuse to sell materials to them. Notwithstanding all these malicious proceedings, the firm prospered, and the Union managers then had the usual circular printed and distributed broadcast, informing the public that the firm employed unskilled men, and did inferior work as contractors. At this point the firm thought the matter had gone far enough, and appealed to the law. By the time it had heard the testimony, the jury was unanimous in favor of a verdict for the plaintiffs; the only question that it considered was the amount of damages that should be awarded. Naturally, the actual loss that a person or a firm suffers from such foul attacks is, in most cases, incapable of exact estimate. The law does not allow the jury to take a handsome sum from the offender and confer it upon the victim, as a consolation for the injury done to his feelings; it can only award such a sum as will reimburse him for his actual loss of business or reputation; and it is not surprising that one juryman thought that seven hundred dollars would pay for all the actual harm that the Union was able to inflict, while another thought that fifteen thousand dollars was not too much to award. Finally, these diverse views were harmonized, and a verdict was brought in for thirty-seven hundred dollars, twenty-seven hundred of which the jury thought was a fair estimate of the pecuniary loss caused by the publication of the circular, while it considered that one thousand dollars would pay for the damage due to the previous proceedings. The next thing will be to collect the money. Like private persons, unions which have no property can damage other people's business as much as they like, secure in the knowledge that no one can make them suffer from their actions, and we fear that after execution had been issued the financial condition of a good many unions would be found less flourishing than their treasurers' reports indicated. Perhaps a good way would be to enact a statute, under which, in the case of such wanton mischief as this, the officers of the Union, in default of money to make good the damage they had caused, might be sold as slaves for a limited period, and the proceeds of the sale applied to satisfy the judgment. This method of disposing of the cases would have two advantages. Not only would justice be secured in favor of the person aggrieved, but the union officers would have an opportunity for practising useful industry, such as they seem to find it difficult to meet with under ordinary circumstances.

THE people who live near oil-wells and salt-works ought to take warning from the fate of some villages in England, in the county of Cheshire. According to the *Builder*, the property-owners in the town of Northwich have petitioned the Government to send a Royal Commission to see the damage which has resulted from the working of the salt-mines in the vicinity. The surrounding district, like that about Syracuse, in New York State, is filled with wells, from which are pumped enormous quantities of brine, containing about twenty-five per cent of salt, which is recovered by evaporation. About one million tons of salt are thus manufactured in Cheshire every year, and sent away to all parts of the world. The removal of all this matter from the subsoil causes settlements, which have been more serious and extensive this year than ever before. In the region about the village of Winsford more than one hundred acres of land have sunk, and are now covered with water to a depth of twenty feet. The Winsford market has sunk thirty feet, and one of the houses in the village has gone down so far that only the top of the roof is now visible above ground. Throughout the entire region, streets, houses, bridges, gas and water pipes are moving so rapidly that continual rebuilding and repairing is necessary. The memorial represents that the owners of the salt-wells pump out and sell the salt on which the houses of the citizens rest, and keep the money; while the citizens themselves not only have to spend large sums in rebuilding their own dwellings, but are taxed to repair the highways and other public property; and it prays that an impost may be laid on the salt trade sufficient to pay the damage caused by its prosecution.

THE *British Architect* gives some figures from the reports of the public gas companies in England which are interesting. In many cases there the towns own the gas-works, charge fair rates, and appropriate the profits to public improvements; but there is certainly a surprising difference, either in the circumstances under which the gas is distributed, or the economy with which the manufacture is carried on, which shows itself in a great variation in the profits derived from the business. The lowest price charged for gas in 1887 was in Plymouth, a small city in Devonshire, where it was sold for forty-two cents per thousand feet, and at this price the year's business earned a dividend of thirteen and one-quarter per cent on the capital invested. The highest price charged was a dollar and eighty cents a thousand cubic feet. This was at Walton-on-the-Naze, and even at this rate no dividend was earned.

THE Royal Academy of Science of Turin announces that the prize founded by the will of Dr. Cesare Alessandro Bressa, amounting to twenty-four hundred dollars, and open to authors and inventors of all nations, will be awarded at the end of December, 1890, to that competitor who shall have made the most important and useful discovery, or published the most valuable work in physical or experimental science, natural history, mathematics, chemistry, physiology, or pathology, or in geology, history, geography, or statistics. The prize will be awarded by the Academy of Turin, and all its members, resident or non-resident, are excluded from the competition.

VISITORS to Europe this summer can entertain themselves in London by visiting the Spanish Exhibition, which is to open there in April. The President of the Exhibition Company is the Duke of Wellington, who ranks as a Spanish noble, and the affair promises to be interesting. Among other things, a herd of Andalusian bulls is to be imported, together with a large number of matadors and other persons, and bull-fights will be shown daily. It is said that these will be free from the cruelty usually accompanying them, so we suppose the bulls will have their horns cut off. A special point will be made of the costumes of the various provinces, and natives of Cordova, Salamanca, Granada and the Basque provinces will be seen in their native villages, engaged in the sports or occupations peculiar to them. In manufactures Spain is not particularly rich, but Cordova leather, Toledo steel and damascened work, laces and cigars, will be exhibited.

MR. SANDERS, of St. Petersburg, has revived, in a modified form, the old Liernur pneumatic system of sewerage, with improvements that seem to make it practically available in many cases where the other is not. Under the Liernur system the entrance of water into the sewers is avoided as much as possible, and even Dutch cleanliness does not suffice to keep the house-drains of Amsterdam, exhausted periodically by suction, but not flushed, sweet enough for American taste; but the Sanders system encourages the use of water, disposing of the matters with which it deals by means of ejectors, which will transfer solid substances to the outfall, but work more freely with liquids. It is probable that when a severe epidemic of diphtheria shall arouse the public again to the importance of sewerage in our inland towns, disposal by irrigation will be generally preferred. In this case there will be many improvements needed in the methods of conveying the sewage to the irrigated fields. The pumps, settling tanks and stand-pipes which have hitherto been employed are cumbrous and expensive, and a good system of ejectors, buried far enough underground to be out of reach of frost, and operated from a central station, might be less troublesome, as well as more efficient, than tanks and stand-pipes.

BUILDERS' HARDWARE.[1]—XVII.

LOCKS.

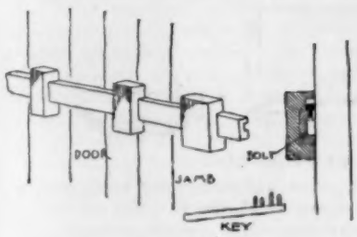


Fig. 277*a*. Egyptian Wooden Lock.

ANY one who should visit the mediæval museums of Europe, and should chance to see among the curiosities of iron-work some of the elaborately wrought and apparently intricate locks of the fourteenth, fifteenth and sixteenth centuries, would hardly think of comparing those unweildly and cumbersome devices with the locks that are turned out in such quantities by our best modern manufactories. And yet, if the older contrivances are examined attentively it will be seen that the difference between the old and the new is one of finish and delicacy, rather than of idea or mechanism; and that, with the exception of a few noteworthy inventions for obtaining a greater security against picking by an ordinary thief, the locks of to-day are exactly the same, in principle and arrangement, as those which were made centuries ago. Indeed, it is rather strange that with all the inventions which have been made during the nineteenth century and especially within the present generation, and notwithstanding the inventive genius which American industry has brought to bear upon the subject, the Yale system should be, after all, very nearly the only invention of practical utility which is a direct departure from the older methods of lock making. Probably a large proportion of the readers of this paper can distinctly remember the time when pin locks were almost unheard of. It might be said in explanation of the seeming fruitlessness of mechanical research upon this subject, that there was really very little that could be discovered or improved upon, as the real principle of a lock is too simple and too definite in its nature, not to have been thoroughly appreciated and exhausted long ago; but the same could have been said before Linus Yale brought his Yankee wit to work upon the subject, and it would be impossible at present to foretell what discoveries may be made or what radical changes brought about in the appliances for locking our doors. Possibly our descendants may some day wonder at the locks of the nineteenth century, even as we wonder at the cumbersome pieces of mechanism and the ponderous keys of our great grandfathers. At any rate, it will not do to claim that our locks are perfect, or that the record of progress is entirely closed. A very few years ago the Yale lock was pronounced to be complete; but some very radical improvements have been made in it since then, and the opponents of the system claim it has yet many defects both in construction and idea. So it would not be strange if our best locks should one day become obsolete.

But if the progress which has been made in the essential, mechanical principles of lock manufacture is small, the improvements in finish and the reduction in the cost of the locks have been marvelous. Less than a century ago, locks were made entirely by hand, and very crude affairs they were, too, costing a great many times the price of a better article of to-day. At present, good, well-made, well-planned locks can be had at prices varying from twenty-five cents to five dollars, suited to all needs and all conditions; while the amount of real security afforded is of a much more tangible nature. And with the improvements in niceness and delicacy of arrangement, it has been possible to affect a change in the style and weight of the keys which the present generation can only faintly appreciate. The old-fashioned keys were heavy, cumbersome, and so large that no one ever thought of carrying them about the person. Now they are made so small that the keys for an entire house can be carried in one's vest pocket. Formerly the strength of a lock was judged by its weight, and it was considered essential to have heavy bolts or levers, and strong springs, requiring considerable force to operate; while now, all the parts are so well adjusted and so light, that a touch is sufficient to put the mechanism in operation.

The fundamental principles forming the basis of all locking constructions, include a bolt which is moved by the direct action of the key, while secondary bolts or levers drop into such positions that the lock bolt cannot be forced back except by breaking some portion of the mechanism. The secondary bolt is usually termed a lever, and either acts by gravity or by the aid of a spring — usually by both. The key is so made as to first raise the levers, and then to shoot the bolt by a single turn of the hand. These principles have governed the manufacture of locks since the days of Adam, and apply equally to the ponderous locks of the Middle Ages and to the corrugated-key locks of the Yale & Towne Manufacturing Company. Complications have been added to the construction of locks in the shape of multiple levers, requiring nicely fitted keys, or fancy wards which would allow none but the right key to enter; and there have been special forms devised for bank uses, working by combinations of letters, by dials, or by clockwork; but in the locks used about an ordinary house, the principle is always the same — that of a key simultaneously lifting one or more levers and moving a bolt.

In order to clearly illustrate the antiquity of the principles upon which modern locks are constructed, it may be of interest in this connection to refer to a few of the older forms. A rude style of lock which has been used in Eastern countries for ages, no one can say how long, but certainly for over two thousand years, is approximately shown by Figure 277*a*. All the parts are of wood, including the key. The bolt is channelled on the inner edge, and slides through heavy wooden staples in which are arranged a number of pegs, of varying lengths, fitting into corresponding holes bored through the top of the bolt. The key consists of a flat piece of wood somewhat smaller than the channel which is cut in the bolt, and in use, is inserted lengthwise of the bolt. On the end of the key are pins spaced to correspond with the pegs in the staple. It is evident that while the pegs are caught in the bolt itself and in the staple, the bolt cannot be moved; but when the key is inserted, the pins will be directly beneath the holes in the upper part of the bolt, and by raising the key, the pins will lift the pegs just enough to clear the joint between the bolt and the staple, and the bolt can then be moved at will. In this lock, the action of the key is almost exactly the same as in the Yale lock; namely, to lift a series of pins of unequal lengths so as to bring the bottom of each on the same line, though the Yale key has other functions, as will be noted later.

Figure 278 shows a key which was dug up in Pompeii. It was evidently intended to operate a warded lock, a style which was in almost universal use up to thirty years ago. Figure 279 illustrates a fine old Elizabethan lock. This could be described as a fully-developed lever-lock, the springs on the levers being arranged in exactly the same manner as the locks which are sold over the counter to-day. Stripped of all the fancy cutting and misleading wards which have nothing to do with the efficiency of the lock, it will be seen that this is really a very simple contrivance, though quite complicated in appearance.

Fig. 278. Key from Pompeii.

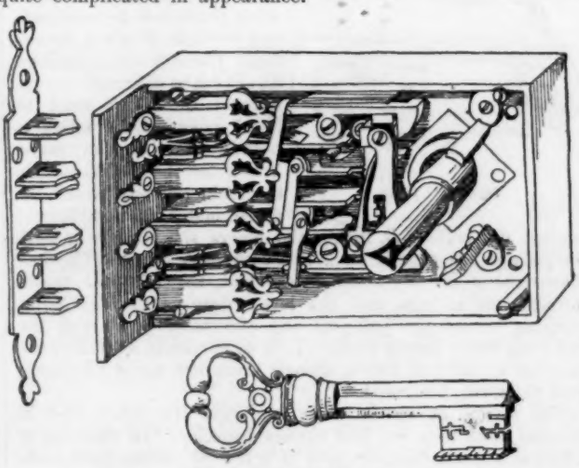


Fig. 279. Elizabethan Lock.

The number of antiquated examples might be multiplied indefinitely, but the foregoing will suffice for the purpose, as they may be taken as types of the three most markedly different arrangements for adding to the security of a lock, namely with wards, with pins or with spring-levers.

[1] Continued from page 8, No. 680.

The various parts of a lock will need some definition and explanation, in order to prevent any ambiguity in the terms. Figure 280 shows the general shape of the ordinary key, in which *A* is called the bow; *B*, the shank, and *C*, the bit. The difference between the keys of to-day and those of two or three generations ago has been already alluded to. Many of the hand-made locks are still provided with the old-fashioned, heavy brass keys, but the "Yale" locks have prejudiced people against anything but a flat key, and nearly all manufacturers use them in one form or another. A few lock-makers have keys which are arranged to fold up like a knife, to be used in connection with rim-locks, or with locks requiring a very long key, but generally the key is of steel, nickel-plated, with a flat shank and a thin bit. When the cuts on the bit are on the side or edge, as shown by the cut, it indicates a tumbler or lever-lock, while cuts on the top or bottom show that the lock is fitted with wards. Many of the old keys preserved in museums are made with very elaborate bits, cut in curious and intricate patterns. In some instances the cuts correspond to equally intricate wardings in the lock, but generally they are purely fanciful. When the shank of the key is tubular, it indicates a lock which can be operated from one side only, such as those used for drawers, etc. All keys for door-locks now have solid shanks.

Fig. 280. Key.

The bolt which secures the lock, is generally made quite heavy where it projects beyond the face-plate, but is thinned down inside the lock so as to be as light as possible, and to give space for the levers. The talon, *A*, Figure 281, is the notch in the under side of the bolt in which the key works. The post, *B*, is the part which catches in the levers, preventing the bolt from being forced. Guide-posts on the case of the lock fit in the slots, *C*, one of the same posts often serving as a pivot for the levers.

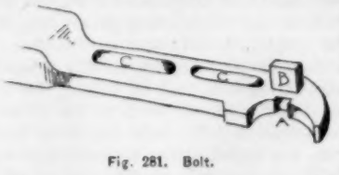


Fig. 281. Bolt.

The most primitive form of lock would be one consisting simply of a bolt, which is shot back and forth by the key. But as any other key or even a wire would answer equally well, some obstacle must be interposed to prevent picking. This is done by combining with the bolt a series of levers or tumblers which permit only the proper key to be used. The two terms are used at present synonymously. Figure 282 illustrates a typical lever. There are from one to five levers in an ordinary lock, and they are usually placed one over the other, pivoted over the guiding-post, and the bolt-post is so arranged as to fit through one of the cuts, *A*, when the bolt is thrown back, and through *B* when thrown out. The connecting gatings, *C*, are cut at different heights, so that the levers must be lifted unequally in order to permit the bolt to move. When the key is turned in the lock, the bits, which are cut to match the levers, bear against the bellies, *D*, lifting the levers simultaneously until the gatings are exactly on a line with each other. The key then catches in the talon of the bolt, the bolt-post passes through the gatings, and the levers drop as the key turns, catching behind the bolt-post and effectually preventing the bolt from being forced back. This is, generally speaking, the function of all lock-levers, though there are many variations from the form illustrated.

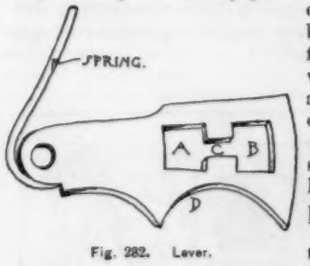


Fig. 282. Lever.

The levers, of course, slide one over the other, and in common locks they are laid closely together. In the best of hand-made work, however, and in a few of the machine-made locks, the levers are separated, either by side-wards cast onto the thickness of the lever, or by intermediate strips of brass which bear on each other and on the levers only at certain points, thus reducing greatly the friction between the parts.

A somewhat different form has been much used in English locks, which is shown by Figure 283. In this case the levers are beneath the bolt. On each is a post which works in slots and through gatings cut through the bolt. Price, in his "*Treatise on Locks*,"[1] which is a very valuable and interesting work on the subject, as it was understood up to 1860, makes

Fig. 283. English Lever.

the distinction between levers and tumblers, applying the latter term to the device shown by Figure 283, and the former to that illustrated by Figure 282. His distinction seems to be a fair one, though seldom made in this country, where what he calls tumblers are little used.

A little reflection will cause one to comprehend the number of changes possible in a lever-lock. The levers may be transposed, and within certain limits the heights of the gatings may be varied, so that with six levers there can be as many as 7,776,000 changes, no two of which can be operated by the same key. Simple transposition, without any variation in the heights of the gatings, will give 720 changes.

A device has been used in some makes of locks, intended not only to increase the difficulty of picking but also to show if the lock has been tampered with. It consists of a spring so arranged that when one of the levers is lifted too high, as would naturally be done by any one attempting to pick the lock, it is caught and held in such a position that the bolt-post cannot possibly pass through the gatings. The spring is released by using the right key and turning the bolt out more, but no key can unlock the mechanism until the detector spring is released. This is a very ingenious arrangement, and at one time was considered absolutely burglar-proof, though it is now very seldom met with in the market.[2]

The wards of a lock are fixed obstructions which are attached to the inside of the lock-case, so arranged that none but the proper key can pass and reach the levers. Formerly the confidence in warded locks was so great that levers and tumblers was used very little, but that feeling has entirely passed away. Modern locksmiths use wards very sparingly, and limit themselves to small shoulders or ridges, cast on the inside of the upper and lower case-plates, which require corresponding cuts on the upper and lower edge of the key-bit. They do not add in the least to the burglar-proof qualities of a lock. At one time, however, locks were constructed with very elaborate wardings. Figure 284 illustrates the wards of a French lock about one hundred and fifty years old. The wards consist of two thin plates, one each side of the key-hole, with a series of ridges forming a semicircle on each, the ridges being star-shaped in section. The key-bit is cut out with a star pattern which has to exactly fit the wardings. This is one of the simpler forms which the ingenuity of French locksmiths at one time delighted in, and though seemingly proof against intrusion, can be opened with very little trouble, by a judicious use of a few stout wires.

Fig. 284. Wards of an old French Lock.

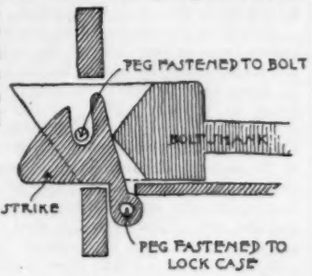
There is a great difference in the quality and arrangement of springs used in connection with a lock. In regard to material, the best is, undoubtedly, phosphor-bronze; but springs of this material require to be so large in order to have the desired stiffness, that their use is not always practicable, especially as they can be used to advantage only in the shape of flat-bands. The springs which hold the levers in place against the bolt-post are usually made of round steel or brass wire, and are attached directly to the heel of the lever, as shown by Figure 282. A separate spring is necessary for each lever. It is sometimes desirable to attach the spring to a secondary lever acting directly on the top of the main lever, Figure 285, as in a case where the levers move up and down in the lock instead of being pivoted together. With such an arrangement the edge of the secondary lever should be grooved so as to fit over the top of the primary lever, thus obviating

[1] This work is entirely out of print, but can be found in most of the large public libraries. It is complete and thoroughly illustrated.

[2] The detector-spring was an important feature of the celebrated "Chubbs" (English) locks.

any difficulty of the levers slipping by each other, or of the wrong springs acting on the levers.

The latch is a feature of the modern lock which our ancestors did not enjoy. Except in the case of store-doors, all door-locks are now made with some form of spring-latch. There are three distinct kinds of latches commonly used, the simple spring-latch, anti-friction latch and front-door latch. The cheapest form of ordinary spring-latch consists of a bevelled head, projecting from the face-plate of the lock, with a shank inside the lock, about which is coiled a strong spiral spring, keeping the latch pressed out. The inner end of the latch-shank is forked and hooks under each side of what is termed the follow, through which passes the spindle of the door-knob. Turning the knob either way draws back the latch. The objection to this arrangement is that while only a very slight spring is really necessary to keep the latch in position, a pretty strong spring is required so that the knob shall not turn too easily; otherwise, every time the door-knobs were touched the latch would be opened. Consequently in the better class of work a door-latch is usually fitted with two springs, one of which is operated when the latch is pushed back by the door being closed, while both springs are acted upon when the knob is turned. In this way the requisite resistance can be obtained for the knob, and, at the same time, the latch will close easily. A latch so arranged



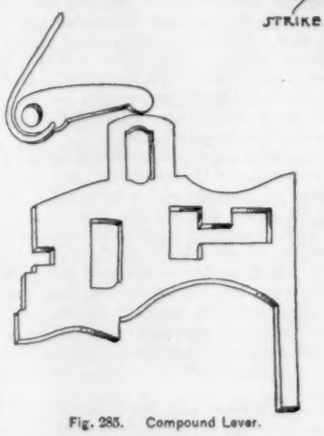


Fig. 285. Compound Lever.

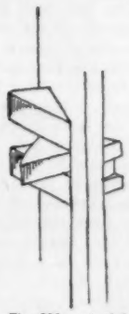


Fig. 286. Anti-friction Strike. E. Robinson.

is termed an easy spring-latch. There are several methods of attaching the two springs. Ordinarily, spiral brass springs are employed. Hopkins & Dickinson and, we believe, a few others, are able to introduce into their locks springs made of phosphor-bronze, which, it is claimed, will keep its elasticity much longer than steel or brass. The different methods by which the springs are attached and the knob operated will be made clear when the various makes of locks are described, later on.

The ordinary form of latch is made with a V-shaped bevel, the long side of the bevel striking against the jam-plate. Enoch Robinson, of Boston, was, it is believed, the first to patent an anti-friction strike, as it is called. Figure 286 illustrates the construction of his device, which is incorporated into all of the locks which he makes. It is simply an application of the principle of the old bell-lever crank. The action of the anti-friction strike is to raise the latch-bolt from the bed of the lock and carry it back without friction on the sides. Actual tests have been made proving that it requires less force, acting directly on the side of the anti-friction strike, to force the lever back, than is required to push back the latch by straight pressure against the apex of the bevel.

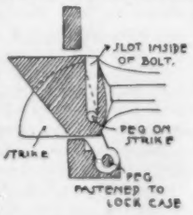


Fig. 287. Anti-friction Strike.

Figure 287 shows a form of anti-friction strike used by several other manufacturers. There is no difference in principle between this and the "Robinson" make, though the appearance is a little different, the "Robinson" strike being in the centre of the bolt, while the others are on one side, also in "Robinson's" strike the pin is on the latch and the slot in the strike, while in the other anti-friction strike they are exactly the reverse. Figure 288 shows

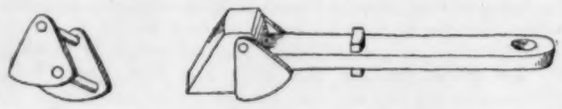


Fig. 288. Anti-friction Rocker Strike.

a form which is made by a few manufacturers, being listed in the catalogue of both J. B. Johnston and the Nashua Lock Company. It consists simply of a steel rocker attached by swivel pins to the bolt, the lower pin passing underneath the shank of the bolt. When the door is closed the latch, instead of moving straight back, swings on the lower edge of the rocker, being lifted from the lock-frame, and thus reducing the friction. The gain by this device is, of course, less than by the others previously described. Yet another form of so-called anti-friction strike is made. Figure 289 shows the pattern adopted by Hall, of Boston, for his spring-latches. It consists, essentially, of an adaptation of the well-known car-door latch, the latch-strike being hinged at the base and attached by a loose-pin to the latch-shank at the top, while the face of the latch-strike is curved slightly. This device makes really a very efficient anti-friction strike. The only objection to it is that the wide plate necessitated by it cuts the door a great deal, and many persons do not like it on that account.

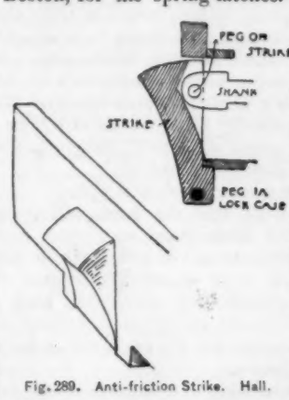


Fig. 289. Anti-friction Strike. Hall.

The custom in regard to latches varies in New York and Boston. In New York the outside knob is generally fixed firmly so as not to move at all, while in Boston the knobs are arranged with a swivel spindle permitting either to be turned without acting upon the other, and the mechanism inside of the lock is so devised that by pushing a button or a slide the outer knob can be held fast. In cheaper forms of front-door locks, the knob-spindle is made without a swivel, and security is obtained by a bolt on the inside.

Locks are designated as being either right or left hand, though the distinction is one which is confined entirely to the latch. A left-hand lock belongs to a door fitted with left-hand hinges, as has been previously explained, the term right or left being decided by whether the door turns on the hinges

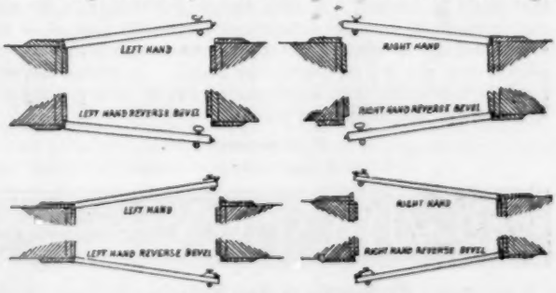


Fig. 290. Right and Left Hand Locks.

when opening either in the direction of the hands of a clock or the reverse. Locks are also designated as being either left or right hand reverse bevel, the reverse bevel applying to a door which swings out instead of swinging in. That is to say, in the case of a front door, for instance, if it swings out the night latch would be on the outside, but the latch bolt would be just the reverse in arrangement from what it would be, relatively, on an ordinary front door swinging in.

Figure 290, will fix this distinction clearly in mind. The figure is taken from the catalogue of the Yale & Towne Manufacturing Company. It is believed that the distinction between right and left, and reverse bevels is seldom appreciated by architects.

It is very often desirable to have a latch which can be reversed so that if any mistake is made in ordering, the lock will not be useless. Reversible latches are made in several ways the latch shank being generally of such shape as to permit its being turned over and worked in the opposite direction, without interfering with the action of the lock.

Locks wear out not so much by actual failure or breaking of the parts, but by the lever and key wards being worn so that the key will not lift the levers and permit the bolt to pass. Key-wards are the slight projections which are cast on the inner face of the lock-plates to form an additional obstruction to the passage of strange keys. Of themselves they affect the value of a lock but little, as the key will operate as well without as with them, so that the only part which actually wears out is the edge of the levers against which the key acts. The constant striking and turning, when a lock is used continually, will in time wear off the surface of the lever so that it will not rise quite sufficiently to allow the bolt-post to pass. The springs, also, sometimes become brittle, and the follows operating the latch will wear so as to work loose and rattle, but a little tinkering can remedy any of these difficulties. It costs but a trifle to have a new key made which will fit a partially worn-out set of levers. New springs are inserted at a trifling cost, and if the latch-spring is lengthened a trifle the rattling of the follows can be obviated; so, there is, really, no reason why a fairly good lock should not last indefinitely. It is, also, a very simple thing to make a new combination of the levers when they cease to work smoothly, and renewed life can thus be imparted to an apparently worn-out set of works.

In judging of the intrinsic worth of a lock, therefore, the following conditions should be carefully observed.

First: Good material for the use to which it is put.

Second: Careful adjustment, so that the parts will work easily and will stand any possible strain in use.

Third: The whole secret of the value of a lock is in the levers, which should be so made as to ensure a minimum of friction, of material not easily corroded nor easily worn away; and they should be adjusted to secure the greatest amount of security against picking, with springs not too easy, nor so hard as to bring undue wear on the levers.

A very good test of the workmanship of a lock can easily be made by shooting out the bolt, removing the cap to the lock case, and then pressing in strongly on the bolt, at the same time lifting the levers, one by one. If the gatings are accurately fitted they should all bear equally against the bolt-post, so that the gating of no one lever would catch on the post as it is lifted by. Few of the ordinary locks will stand this test successfully.

Intricate combinations, made ostensibly to prevent the lock from being picked, add very little to its value for ordinary house work. It may be safely stated that any lock can be picked which is operated by a key, so that a good three-lever lock affords all the intricacy and gives one all the protection that could be desired. A lock has a personality of its own, and so much of its value depends on the maker that it is wise in purchasing to always get the best; keeping in view simplicity, and the points previously noted. A cheap, but well-made lock is better than an expensive one which is put together in a careless and indifferent manner.

[To be continued.]

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE ALGONQUIN CLUB-HOUSE, COMMONWEALTH AVE., BOSTON, MASS. MESSRS. McKIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

[Gelatine print, issued only with the Imperial Edition.]

TWO STREET VIEWS IN QUEBEC, CANADA SKETCHED BY MR. ROBERT BROWN, JR., ARCHITECT, BOSTON, MASS.

See paper on "Quebec" elsewhere in this issue.

SUGGESTIONS AS TO THE CONSTRUCTION OF SLOW-BURNING HOUSES, CHURCHES AND HOSPITALS.

For explanations see the following article.

HOUSE AT ROCHESTER, N. Y. MR. THOMAS NOLAN, ARCHITECT, ROCHESTER, N. Y.

SLOW-BURNING CONSTRUCTION.[1]

In order to meet the frequent calls for plans for the safe or slow-burning construction of office-buildings, dwelling-houses, and other buildings auxiliary to the factories which come under the supervision of the Mutual Companies (such demands having more than once been made for plans of slow-burning churches and hospitals), certain studies are herewith presented which may be a good basis for suggestion and for further improvement.

These plans, even if they prove to be crude and imperfect, will certainly assure greater safety than can be expected when offices, houses, churches, and hospitals are built according to the common practice of combustible architecture.

The ordinary method of building a wooden dwelling, hospital, or other similar structure may be called the cellular system of construction. The floors consist of a series of wooden cells; the walls constitute another series; the roof is the worst and most dangerous series of all; each cell in each series being connected in some more or less open way with all the rest.

Provision is made in many contracts for cutting off the communication between the cells of the main floor and the vertical cells in the walls, either by laying bricks between the studs upon the sill or by some other suitable method; the intention of these safeguards being to prevent either vermin or fire passing from the cellar through the cells in the first floor to the cells in the walls, and thence throughout all the floors and partitions to the roof. These provisions of the contract are excellent *on paper*, but, when left to the average supervision of the architect and of the contractor, they are very apt to fail: the mice almost always find a way through the smaller cracks, and the rats follow; the fire also finds its way everywhere through all the cracks with the utmost facility. The writer knows from personal experience that even if the most careful provision be made in the contract, and even if the work be supervised day by day by the owner himself, all the customary devices may utterly fail to keep rats and mice out of hollow walls in a wooden house.

But even if the common contract precautions should suffice to keep vermin from infesting the house, yet the customary plan of construction utterly fails to prevent the passage of fire from cell to cell, and through the same cracks by which the fire may pass there is a constant circulation of air. This circulation of air, although it may be slow and somewhat obstructed, yet practically destroys the value of the air-spaces in the walls, which walls are assumed to be non-heat-conducting because of this air-space. It is admitted that, if air be encased in a substantially tight cell free from circulation, it may be one of the very best non-conductors of heat and cold; but the air-spaces in the walls of a wooden building, as ordinarily constructed, are nothing but a fraud; *there are small open-air ducts connected by cracks and crevices everywhere.*

It is generally assumed that an air-space is in the nature of things one of the best of non-conductors, without much regard as to how the air is encased; but the error of this assumption was disclosed by the experiments made at the instance of the factory underwriters a few years ago for the purpose of determining the conditions most favorable for preventing a loss of heat by radiation from steam-pipes. In the course of this work, which was of the most thorough nature both as to the methods employed and the extent and variety of materials tried, it was found that an air-space was a very good conductor of heat by reason of circulation by convection, which resulted and effected a very rapid transfer of heat; on the other hand, the non-conducting property of many substances which proved to be most efficient was undoubtedly due to the small, isolated cells of entrapped air which they contained. In our tests, a given material, when placed in a loose or porous condition about a pipe, proved to be an effective non-conductor; yet, when pressed to an extent which closed up the air-spaces or pores, the same material served as an effective conductor of heat.

It may be interesting to cite the fact that an air-space would transmit a quantity of heat represented by the number 1302, the radiation of heat through wool under similar conditions being represented by the numbers 301 to 237, according to the amount of pressure applied to it. Charcoal was found to be subject to about the same rule as wool. The application of these results to the construction of buildings leads to the conclusion that the most effective non-conduction of heat may be attained by cutting up air-spaces in such a manner as to prevent circulation by convection, or by the connection of one air-space with another.

An effort has, therefore, been made to make framing-plans and specifications, which are submitted herewith as studies of the question, for the construction of the class of buildings under consideration, in which the timbers shall be so arranged that the builder will be obliged to go out of his way and to work on an entirely different framing-plan, in order to connect one cell either in the floor or wall with any other cell in any other part of the building. The motive

[1] A Circular issued by the Boston Manufacturers Mutual Insurance Company.

is to compel the builder to do his work well in this particular, even if he does not care to do so, or might not know how.

On this motive the framing-plan of a church has been made by a student of architecture (sketch No. 1), and a framing-plan and method of plastering for a dwelling-house have been devised under my own direction (sketch No. 2). In respect to both dwelling-house and church, it is suggested that there is no reason why there should be any cells in the main floor, such as will be made if the basement-ceiling is either sheathed or plastered on the underside of the timbers. So far as this floor is concerned either in a dwelling-house or a church, there may be no objection to the downward passage of sound; therefore, the money commonly expended in sheathing or plastering had much better be put into the substance of the floor, and the open-timber or mill-construction may be adopted on this story in any and every case. If this floor is made of two-inch plank grooved and splined, covered with three-fourths-inch mortar, good sheathing-paper, and then finished with a good, hard top-floor, birch preferred, the cold air of winter may be permitted to circulate freely through the cellar or basement without any danger of passing up through this solid floor, to the discomfort of those who occupy the stories above, and the upward passage of sound will be very slight. If the heat required in the main floor or story be brought in near the centre of each room a little below the ceiling, with right provision for ventilation, the floor will be well warmed at any and all times; while, on the contrary, if the heat be brought in through registers in the floor, it will rise and accumulate near the ceiling, while the cold air from the windows, which either comes in by the cracks or through the glass, will fall and spread itself over the floor, to the great discomfort of all the occupants. May it not be that people bake their heads and bodies, burn the air as it comes through the furnace, catch colds or get catarrh from vitiated air, in a vain attempt to keep their feet warm? Even in this they may fail, unless bottom circulation is induced by bringing the heat in at the top or overhead.

Under the common conditions of bringing the heat in through registers in the floor, there will be nearly stationary planes of different degrees of heat, to the discomfort of the occupants, cold in the lower plane, and very hot in the upper one, while by the overhead system there may be a very free circulation; even basements with stone floors, which have been of no use in factories when the steam-heating pipes have been placed in the usual way at the sides of the room, near the floors, having been converted into useful rooms, with warm floors, by merely changing the position of the same heating-pipes from the side-walls to points near the ceiling, ten or twelve feet from the windows.

To return to construction: even if the mill construction is considered too expensive for the whole house, and if it is thought that the downward passage of sound through the upper floors cannot be sufficiently prevented, then the motive of the architect may well be to make use of about the same quantities of timber and board which are now required in ordinary framing, but so disposed and so consolidated that, without requiring much more material, the cells in walls. partitions, floors and roof may be absolutely separated each from the other; the frame being at the same time made stiffer and better in every way; the substance of the roof also made thick enough to save the attic or upper story from being an oven in summer and a refrigerator in winter. To this end the plans of the dwelling-house are submitted. They speak for themselves. Posts and floor-beams may be 10 x 6 inches; studs, 4 x 6 inches, placed five feet on centres. These sizes may be substituted for the ordinary construction of 2 x 4 inch planks, posts and studs, with little or no increase in the quantity of material required in the lower story; the second story is drawn in the ordinary way.

The method of constructing the foundation, placing the sill thereon, and the method of adjusting the girders and plate, are so devised that even the most uninstructed builder cannot connect any number of cells anywhere without using more ingenuity than he customarily applies to the ordinary conditions of framing in making such connections. The diagonal furring and lathing convert the wall into a truss, strengthening the building, and this system of plastering on the plank, as drawn in the lower story, also lends itself to the separation of the cells in the best manner.

If the second story should be built of 2 x 4 studs, boarded and not planked, one special provision will be called for to cut off the second-floor spaces from the wall-spaces in the second story, to wit: solid blocks between the studs; but even if this were neglected, little harm would come from it, because there is no open way from the first to the second floor.

It may be suggested that a cheap method of making small wooden dwelling-houses much safer from fire, and also warmer in winter as well as cooler in summer is to fill-in between the studs behind the plastering and inside the boarding with sifted coal ashes mixed with mortar, just enough mortar being used to bind the material.

In this way many buildings of bad construction have been made suitable for mutual insurance to the great satisfaction of the owners, who have discovered after the spaces between the studs set up inside of brick walls with a view to the supposed non-conduction of an air-space, that their buildings have been made much warmer in winter, cooler in summer, and safer in every way, after the ashes and plaster had been poured from the top into these spaces between the studs, than they were before this precaution had been taken.

These plans and specifications are submitted as primary studies only, subject to suggestion and to improvement. The same problem needs to be solved for the construction of brick dwelling-houses and hospitals, as well as those built of wood. The Building Act of Boston and the customary forms of contract call for incombustible stops at every floor, behind the furring or mop-board.

Do these provisions suffice? In what proportion of the houses, hospitals, or asylums constructed under the present system are there not a number of more or less open ways, by which vermin or fire may pass from basement to roof? Cannot some framing or floor-plan be devised by which the ignorance, stupidity, or carelessness of workmen or contractors may be rendered incapable of opening a way for fire, except at an increase of the cost or of the work?

At the suggestion of the writer sketch No. 3 has been made, in which a plan is submitted for cutting off the connection between the air-spaces or cells of each floor from the air-spaces in the walls of a brick hospital or dwelling-house furred in the usual way, and for separating the latter at each story. It is admitted that if specifications like those of the present Building Act of Boston are completely carried out, there would be no need of any further provisions for fire-stops; but the carrying out of the provisions of the Building Act for placing stops at each floor calls for some additional work on the part of the builder, which may be omitted, neglected, or shammed. The motive of the suggestion submitted in sketch No. 3 is to build the walls themselves in such a way that, when the floors and the furrings are placed in position, the projections from the brick wall and chimneys will be interposed between the air-spaces, thus making the necessary stops without requiring any additional or special work to be done.

In order to stop the air-spaces which are of necessity left between the brickwork of chimneys and the studs which support the lathing around them, it is proposed to corbel the brickwork on the sides and the back of the chimneys as well as on the front.

The studs at the sides and on the back of the chimneys may be placed in position supported by brickwork, which will cut off any possible connection with the air-spaces in the stories below or above. A horizontal wooden support to the studs is placed over the brickwork (which timber should be laid on a thick bed of mortar between it and the bricks), in order to provide for the same shrinkage that may occur in the floor-timbers.

This plan may make safety consistent:

1. With economy.

2. Even with the rule-of-thumb methods of carrying out plans and specifications the motives of which the builders may not themselves understand, so that the faults in the present methods of construction will be cured without the extra work of putting special stops at each floor. It is in this way that the mutual underwriters have made it for the interest of every manufacturer to adopt their plans and methods; because, even taking no cognizance of the greater safety from fire, their plans and methods of construction have been conclusively proved to be the least costly ways in which buildings can be erected, which will be most suitable for the occupations upon which they take risks.

In the case of the hospital or asylum, again, if the mill floor and open timber construction are objected to above the main floor over the basement or cellar, the common cellular floors may be adopted; but, according to the plans submitted, there may be no direct communication between these cells and of one story with those of another.

It is assumed that when such attention is given to the slow-burning construction of a hospital or asylum as would be implied by giving attention to this suggestion, the same reasoning would forbid any of the common bad forms of roof, especially of the "crazy order," which now render so many of this class of buildings costly, dangerous and unsuitable. The solid deck-roof of plank, not less than three inches thick, would become a necessary element in this plan of construction.

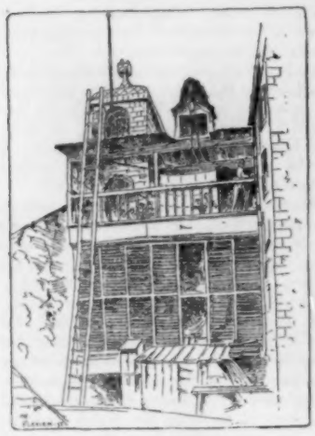
The basement floor had also better be of plank, laid over a properly prepared concrete, in such manner that it may not decay and without any open space beneath in which fire or vermin can exist. Of such plans for basement floors we have more than one which have stood the test of time. Respectfully submitted,

EDWARD ATKINSON,

President Boston Manufacturers Mutual Fire Insurance Company.
Boston, January, 1889.

LONDON'S WATER-SUPPLY. — A somewhat alarming view of the condition of the water-supply of London is taken by Major-General Scott in his official report published in the annual volume of the Local Government Board. "On a general view of the whole circumstances," he says, "it seems evident that the question of the water-supply of the north and east of London has entered a critical stage, and it may be said that the restriction in the supply found necessary by the East London Company during the past summer [1887] was a premonitory symptom of difficulties which in future seasons of scanty rainfall will be more severely felt." The Board also remark "that at no very distant period the margin between supply and demand may become perilously small; and that, at any rate, in the case of some of the companies, the question how the existing sources can be supplemented from others outside the watersheds of the Thames and Lea, is one of which the consideration cannot be long deferred." — *Pall Mall Gazette.*

A GLIMPSE OF QUEBEC.[1]



On Flavien St.

IF, in the course of the descriptive sketch which I have ventured to bring to your notice this evening, I diverge too much from the beaten paths in which an architect is supposed to tread, I ought to say, in explanation, that these observations on Quebec are chiefly the result of a brief holiday tour, and not the outcome of any serious study; and, if I become too discursive, I must plead the holiday attitude or present the plea of "general interest" allowable by our rules regarding topics whose relationship to architecture and the fine arts is not apparent.

When the heat of summer makes us long to leave the dusty city and our routine work, a sail to northern climes, to mingle for a time with a foreign race and hear another language spoken than our own — to sojourn in a country whose life and aspect is a perfect contrast to our own — gives rest and healthful change.

Nowhere will the sportsman find a better field for rod and gun than round about Quebec; and to the lover of the picturesque, to the artist in painting, poetry or romance this northern city gives themes of surpassing interest.

The scenery in the surrounding country is delightful. Other landscapes may be grander, more sublime, but none more interesting from the human existence and association wrought for three centuries into the very soil. It has what Matthew Arnold called "the charm of beauty which comes from ancientness and permanence of rural life."

The inroads of modern progress and the effects of increasing commerce have touched this northern capital but lightly. The conservatism of its religious life has left the spirit of a bygone century in every stone. In some aspects it is still mediæval. The *habitants*, from the country round, gather now in quaint groups in the market-place, just as they did a hundred years ago. They bring their flowers and fruit full many a mile. Their quiet horses stand in rows beside the wagons looking as much domesticated as the house cat.

Priests and nuns move in groups along the narrow streets or walk in procession on saint days as in the days of the old *régime*, and on every hand there is some landmark, some old building to remind us of stirring events in the life of the old colony — New France.

As in the case of the ancient capital of Scotland, so here, Nature has bestowed a site of incomparable grandeur. Abruptly from the

Sous Le Cap.

noble river rises the rock round whose base clusters the lower town, while higher up the churches, monasteries, towers, terraces and ramparts spring, until we reach the citadel which crowns the lofty summit.

A brief study of the topography of the place shows us at once a natural fortress. From the geologist we learn that the land on which the city stands was once an island, for at Cap Rouge, about eight miles above Quebec, the formation of the rocks distinctly show that a channel of the St. Lawrence forked northwards, and probably followed the present course of the Charles River. From Quebec to Cap Rouge the bank is formed by towering rocky headlands, the slope on the northern side to the valley, in many places, being almost as steep.

From the terrace called Durham, on a summer's evening as we stand more than two hundred feet above the river, a truly magnificent panorama lies before us. So steeply does the cliff fall away from the terrace that we look down on the chimneys and roofs of the lower town, and wonder how the people there live under the snowdrifts of winter's long reign. The broad, sombre river flows northwards and eastwards from the Isle of Orleans. On the northern shore the eye follows a winding road, along which straggle little cottages, each with a ribbon-like strip of farm-land, and here and there a church — the village heart. Beauport lies nearest Quebec, then Montmorenci, L'Ange Gardien, Château Richter and Ste. Anne (La Bonne Ste. Anne, as the villagers lovingly call it), until in the blue gray distance Cape Tourmente, forty miles away, closes the vista. The scene looked peaceful and beautiful in the deepening color of the setting sun, changing from green to purple the Lawrentian range of mountains which bound the view to the northward.

In the valley to our left, the narrow Charles River flows on its sinuous way to join the St. Lawrence. It was on this river near where a little stream, the "Lairet," joins it, that Jacques Cartier, of St. Malo, wintered in 1535, and the remains of the fortification built there by him, three hundred and fifty-three years ago, can still be seen.

In 1608, Champlain landed at Stadacona, which was the Algonquin name of the place where Quebec now stands, the word meaning the narrowing of the waters, for the St. Lawrence is, at this point, less than a mile wide. Champlain and his followers founded the city, and he was the first governor. From that time, down to 1759, one governor followed another, each appointed by the ruling powers of France.

The city has been besieged no less than five times, and often been the prey of extensive conflagrations. The last great siege of 1759 must have laid in ruins the greater number of its buildings; yet, considering these devastations, it is surprising to find so many structures with the stamp of age. As the French people, after Canada had passed into the hands of the British, were left with entire religious liberty and their existing institutions, untouched, we may presume, that, with their conservative instincts, they rebuilt and restored on the old lines, or in the same spirit.

The wall on the western side of the city still stands, but, within the past half century, the last of the old gateways was taken down. The

Ste. Famille St.

old archways were found too narrow for the increasing traffic, and, instead of diverting the road to one side and piercing the wall with another archway as might have been done, the old gateway with its guard-room over loopholed for firing on the enemy, was also demolished. The modern gateways are prosaic-looking, and without interest to us. Quaint and picturesque as this gray old capital is now, how much more so must it have been in the middle of last century. Let us hope the Quebec Historical Society, so far as its influence can go, will carefully preserve all that is left, and save the city from further acts of vandalism.

The churches and chapels are, perhaps, the most interesting of the buildings in Quebec. Chief amongst them is the French Cathedral consecrated in 1666 by Monseigneur De Laval, the first bishop of the colony. The style of the present interior is that of the time of Louis XIV, and this style pervades the interiors of the other churches as well. There is much gilding and white paint. The church is of good proportions, with a lofty nave, covered by an elliptical vault under a high pitched roof. The windows are semicircular-headed, without stained-glass and divided into small panes. There are two sets of sashes, the outer being flush with the outside face of the wall.

We are accustomed to associate the style of Louis XIV with ball-rooms and apartments devoted to festive purposes, and one might suppose in a church such a style would not lend itself to the devotional spirit, but, to my surprise, it seemed quite otherwise.

I stood near the entrance, far back, and took in the whole picture. One by one the worshippers came in, dipping their fingers as they passed into the holy-water near the door, then kneeling in the foreground or by some side altar. The brilliant high-altar and the large paintings which adorned the walls; the richness of the gilded ornament, the scarlet capes and gold lace of the vergers, the organ in the western gallery and the foreign look of the congregation, made up a most impressive picture. It brought to mind stage-scenes of Irving's, and, but for the costumes of the people, might have been part of the seventeenth century.

I was given a seat near the pulpit in the nave; the singers sang out right lustily, attracting a young lady in front of me who turned around and cast piercing upward glances towards them through a pair of eyeglasses, which at once suggested Boston. Excepting this slight interruption, I felt as though I must be in Europe, so distinctively foreign were my surroundings, and when the warden came

[1] A paper by Mr. Robert Brown read before the Boston Society of Architects, Friday, Feb. 1, 1889.

around with his collection-box, guarded and shadowed by the verger resplendent in scarlet and gold, and carrying his insignia of office aloft, I never dropped a coin more willingly. The priest at the altar robed in gorgeously embroidered vestments, the acolytes in attendance, the wafting of fragrant incense from burning censers, swung first towards the altar, then to the choristers and lastly to us, the unworthy of the congregation, all heightened the general effect. To me the climax came near the close of the service, when the organist, a consummate artist, played slowly and softly, what to my astonished ears was nothing more or less than the old familiar air:

"What's this dull toun to me,
Robin Adair?"

Laval University, which is near the cathedral, contains a large museum. In one room there is a collection of one hundred and thirty-three paintings, several of which, it is said, were sent to Canada by Abbé Desjardin, priest of the foreign missions in Paris, who resided a few years in Canada during the French Revolution. He bought these paintings from some of the old nobility who were then leaving France, and sent them to Canada. Among the collection are three by David Teniers, two by Salvator Rosa and one by Tintoretto.

In the seminary chapel which adjoins the university, were a number of valuable paintings by celebrated masters, all unfortunately destroyed by fire on New Year's Day of last year. Some writers in referring to these paintings in Quebec, have been quite sceptical as to their genuineness. I cannot speak from the standpoint of an expert in this branch of fine arts, but my impression was that many of these paintings had all the characteristics of the several old masters whose names are attached to them, and with reference generally to the large paintings which are framed and hung on the walls of the various chapels and churches, it is immaterial, when we consider their decorative value in the interiors.

Sous Le Fort.

After the cathedral, the most interesting chapels are those of the Ursuline Convent and the Hôtel Dieu. At the former convent you talk with a nun, invisible behind a metal plate, at a barred opening in the hall, and a servant is sent to show you the chapel. The convent was founded in 1641 by Madame De la Peltrie, and afterwards rebuilt in 1686. A monument to the memory of Montcalm is in the chapel, and here lie his remains.

Quebec is a city of contrasts. On a Sunday afternoon I entered the town by the place where once stood the Palace Gate, through which Montcalm rode in hot haste to defend the town. Sounds of primitive music came from a building up the street: the Salvation Army had taken possession. I turned down a narrower street, to the left, and heard a softer strain of music coming from the convent walls. I opened a door and entered an outer garden from which, beyond another wall, I saw through the open windows of a side chapel the veiled figures of the nuns rising and falling as they sang the sacred chants. In the chapel, to which visitors are admitted, were a few worshippers; the arched opening to the side chapel was filled with a metal grating which hid the nuns from view.

The early history of Canada, when Jesuit priests went out to Christianize the Indians, is filled with many a martyr's story. There is nothing in all the annals of the early Christian martyrs to compare with the terrible fate that befel Jean de Brebœuf, a man of noble lineage. It would horrify you were I to relate his torture, yet never did man die more bravely or heroically. "His family sent from France a silver bust of their martyred kinsman, in the base of which was a recess to contain his skull, and to this day these are preserved with pious care by the nuns of the Hôtel Dieu."

One of the most delightful excursions from Quebec is that to the village of Ste. Anne de Beaupré, about eighteen miles down the St. Lawrence. The journey may be performed by either road or river, but the tourist would do well to include both. It will well repay him. A little steamer leaves the wharf at the lower town, about six o'clock in the morning. We sail past the Falls of Montmorenci, a body of water leaping down a sheer precipice full two hundred feet in height. There are saw-mills along the shore near it driven by water-power, and the same force has been ingeniously utilized to generate the electric current which lights Quebec eight miles distant. The spot is memorable, too, as being the scene of Wolfe's first attack on the French, when he had to retreat with a loss of over four hundred men. We sail past groups of quaint-looking farm-houses which form the sleepy villages, stopping now and then at landings by the flats on the river side, until about eight o'clock we step ashore under the lee of steep hills.

At the suggestion of my travelling companions, two French Canadians from Quebec, we repaired, with sharpened appetites, to the Convent of the Sisters of Charity for breakfast. This institution partakes of the character of an hostelry, providing in the refectory plain, substantial fare for the wayfarer and pilgrim. The rates and other particulars about boarding, which are printed in French and English, are hung in the hall. The novelty of the situation led us to think of staying all night, but a chat later on in the day with the girl who sat knitting in the hall and acting as doorkeeper, revealed the fact not explained in the rules and regulations aforesaid, that the regular boarders must be of the gentler sex.

There are hotels enough in the village, one-half of them called "Hôtel de la Bonné Ste. Anne." They are not so picturesque as one would like, for most of them are modern; but, in spite of this, one is again and again here reminded of French country-life. A girl hay-making in a field comes down the road when she leaves her work, looking the very counterpart of her Normandy cousin, or as if she had stepped bodily from one of Millet's peasant pictures. In this pleasant village, under the shelter of a hill called Petite Cap, the pious Governor Aillebout, in 1658, began a church with his own hands; and here I must quote the historian: "Louis Grumont, a habitant of Beaupré, sorely afflicted with rheumatism, came, grinning with pain, to lay three stones in the foundation, in honor, probably, of Ste. Anne, St. Joachim, and their daughter, the Virgin. Instantly he was cured. It was but the beginning of a long course of miracles, continued more than two centuries, and continuing still." Every year, pilgrims came from all parts of Canada and the United States, numbering hundreds of thousands annually. There were cures reported in the newspapers while I was in Quebec, but no miracles were wrought on the day I visited the church, perhaps because it was a Friday, an inauspicious day. Lest any one should doubt the reality of these marvellous works, there stand inside at the western end of the church two circular wooden stagings, about four feet diameter at the base, and from thirty to forty feet high, on which hang many an old stave and crutch, left behind by those who have been cured at the shrine of Ste. Anne.

To the antiquarian, it is a matter of deep regret that the old church was taken down. In 1871 it was still standing, but in a ruinous condition. About two years later a new church, on a much larger scale, was begun, and in due course finished. The old church, to judge from the photographs of it, must have been a quaint and interesting structure. On the site where it once stood a chapel was built, and the picturesque double bell-tower of the old church, shown in this sketch, surmounts it. The old stones were used to build the walls, and some of the old parts of the interior were used in the new chapel. It is thus not destitute of the interesting element, especially as it contains some highly-prized relics, but the big new church across the road, like all the modern work in and around Quebec, very grandiose in its way, has little, if any, artistic merit.

A study of the history of the country leads one to suppose that the building and decorative arts never attained to any marked excellence, nor could this be otherwise. The people were too much under the surveillance of their religious teachers, and their time too much taken up with religious work and exercises; or else they were engaged in war with the Indians, and latterly with their neighbors, the British colonists, whilst the resources of the country, the harvests of the land and sea, were but half developed.

The historian tells us that in the seventeenth century the nuns of the Hôtel Dieu made artificial flowers for altars and shrines, and the boys of Laval's Industrial School, at the seminary, were taught to make carvings in wood for the decoration of churches. Pierre, son of Le Ber, a Montreal merchant, had a turn for painting, and made religious pictures, described as very indifferent. His sister Jeanne, an enthusiastic devotee and recluse, made embroideries for vestments and altars, and her work was much admired and greatly in demand.

There were repeated complaints from the governors and intendants as to the dearth of skilled workmen. The demand was greater than the supply, so it would seem that the priests in charge of the schools were more successful in making good Catholics than good carpenters, masons, blacksmiths, and weavers.

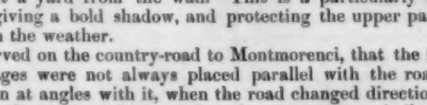
As far as I rambled, there was hardly a moulding or bit of detail worth sketching for further study, but it is possible that I did not explore thoroughly enough. Once, while rambling through the blank corridors of Laval University, I came upon a wooden chimney-piece which reminded me strongly of those still to be found in our old colonial houses. In one of the pencil-sketches you will see what might be called a bit of New England in New France. This was a house of some importance in its day, being occupied by the French governors, but it is now all gone to rack and ruin.

One cause of gratitude we have towards these Northern Frenchmen is that stone was their chief building material. It gives at once a sense of solidity and depth, even when covered, as it often is in many of the older buildings, with a whitewashed coat of plaster. The heavy chimneys, high gable walls, and deep reveals help the effect. Not uncommonly we see the exposed gable-end, and even the chimneys of a cottage, covered, as an additional protection, with wood outside the masonry.

You will notice in this sketch at Point Levis, across the river from Quebec, three different types of wooden houses: first, the oldest, with solid timbers laid horizontally, and dovetailed at the angles, the joints being filled-in with mortar; next, a later type shows the exterior covered with upright planks or boards, even the gables and chimneys being similarly covered; and lastly, the latest

type of all shows a wide projection of the eaves, sometimes extending about a yard from the wall. This is a particularly effective feature, giving a bold shadow, and protecting the upper part of the wall from the weather.

I observed on the country-road to Montmorenci, that the fronts of the cottages were not always placed parallel with the road, being very often at angles with it, when the road changed direction. The simple explanation of this was that the cottages were built with the gable-end towards that quarter of the compass from which the stormy winds would blow, but it is needless to add that, besides the uses of this expedient, it tended greatly to the general picturesqueness.



Point Levis.

The barns in the rear of these cottages were quaint-looking and admirable in color. At the apex of many of the gable-ends the roof projected, as in sketch, forming a kind of hood. In the city many odd-looking dormers are to be seen with similar projecting roofs. A telescope form of chimney, such as appears in another sketch, is another feature occasionally found.

From a study of roofs, one soon notices that ladders are left there all the year around, which would seem to indicate that repairs are frequently needed, owing probably to the frequent use of unpainted tin shingles. And yet, in spite of its drawbacks as a roof-covering, this material has to a stranger — that is, to the artistic stranger — a very charming effect. It soon, by exposure to the weather, assumes a steel gray and gray-green appearance, and those portions which turn rusty have the color of burnt sienna. The effect in the distance is to relieve masses of dull gray by a glistening sheen, like gold, on the rustier roofs. I saw, on the way to Montreal, an old windmill that was almost black, covered with a dome-shaped roof, which shone like burnished gold. It seemed hard to believe that it was simply rusty tin. In the design of the belfries, you will observe that the lower tier of arched openings is almost invariably repeated above on a smaller scale. These belfries often have finials and crosses of wrought-iron, generally light in appearance, as at the Ursuline Convent. There are also iron crosses by the roadside, on the way to Ste. Anne, which doubtless came from France.

In the early days, when the ships sailed only once or twice in the year to the old country, the governors and intendants were much given to writing what might be termed long-winded epistles to the ministers at home; and, as the home government was remarkably considerate of the young colony's claims, it is more than likely that much of the church interior furnishings, such as paintings, metal-work, and embroidery, came from France.

Glancing into the wayside cottages as we passed, we could often see an old chair or a table, plain and simple in form, but undoubtedly ancient. It seemed, therefore, that the town would not be complete without an old curiosity-shop, and when we found it, this, too, was satisfying. It partook very much of the character of a museum, and must be a perfect mine to the archæologist and the antiquarian. It was a rare and varied collection: swords, muskets, and bayonets picked up on the field of battle; bullets and cannon-shot; a piece of the chain that moored one of Jacques Cartier's ships; old Indian curiosities, geological specimens, coins, furniture, silver plate, metal and china ware — filling in all three large rooms. Of old French art there did not seem to be much; but no doubt the curio-hunter has long before this ransacked the country and borne away such booty. Other things seemed to suggest the departed glory of English families, who have probably either gone back to the old country or come to grief in this.

And now a few words about Quebec as a field for the artist. Some of you, in your rambles round about Boston, have perhaps lost many an hour hunting for a subject to sketch. We all know what that means — something interesting, picturesque, and good in composition. I dare say you have found that Nature is not always pictorial. In and around Quebec you will find subjects plentiful, without much need to change or modify, the whole composing happily. It may be a view in the rear of a house, with an odd grouping of various accessories in the back-yard; a few chimneys and old roofs; a large azalea in flower amid ruin and decay; or an old tannery with orange-russet color in the bark on the ground, and dark umber color on the barns and roofs — the hides hanging on a line. Again, there are old boats, stranded on the river-bank — old wharves going to decay, grown gray, green, and umber in color.

Many painters in France represent green fields with a color which any one at all familiar with the work of different schools would recognize as distinctively French. Now, around Quebec, I saw more than once in the fields just such a color of green. Was it merely imagination, or had the landscape become susceptible to French influence, and thus resembled the mother-country? I should be glad to know, from those who have been in both Old and New France, whether this theory has any basis of fact.

From what I have already remarked about the rural districts, it is almost needless to add that the figure-painter, also, finds charming subjects here. In a word, it is a painter's paradise, and some of our Boston artists have found this to their profit. The majority of us, who are but amateur dabblers in landscape-painting, and even those who have no talent for sketching, may benefit largely from the quiet study of such scenes as these. To enlarge our horizon, to rest and drink in the silent influences of the time and place — by the very contrast this makes with our work-a-day world — will surely bring freshened and original thoughts.

Before seeing this country you should know its history well, and, if you read Francis Parkman on this subject, you will be astonished to find how much of an outline your school-history has become. It will afford you, at the same time, a glimpse of this country in the early colonial days, and you will feel grateful to the historian for his able work, doubly enhancing, as it will, the enjoyment of your tour.

With much that is romantic in the annals of New France, we have here also an historical study of peculiar interest. How, on the one hand, the British colonies, peopled for the most part with a race trained in habits of self-reliance, grew strong and independent; on the other, this colony of New France, of earlier birth, but always under paternal leading-strings, reflecting in its later life some of the corrupting influences at work in the mother-country precursory to the French Revolution; and when the end drew near the gathering of the army to defend Quebec, the story of that long summer's siege, the splendid strategy of the gallant Wolfe, his death in the hour of victory, and the brave Montcalm in the hour of defeat — all reads like a page of some grandly written drama. Wreathed with such thrilling historic associations as these, this hoary old town must ever remain a delightful Mecca to all thoughtful and observant pilgrims.

BUILDING LAW.

THE aim of this department will be to answer such questions of law arising out of building transactions, and of general interest to the profession, as may be sent in to the editors by subscribers or others, and also from time to time to discuss in a more general way the various legal questions which are continually arising between architect, contractor, and client. The principles of law applicable to building disputes will be presented, so far as practicable, in the language of the layman, rather than in the technical garb of the lawyer's brief, and as concisely as possible. If correspondents desire further or more detailed answers than the scope of this department and the space at its disposal will permit, they can be accommodated on special application to the editors.

The solution of questions involving a knowledge of local regulations can — with the exception of the building laws of the city of Boston — hardly be attempted, owing to the difficulty of obtaining the ordinances. The questions that interest architects, however, and the disputes they are called upon to settle, usually involve merely a correct application of the general principles of the Common Law; being seldom controlled by the statute laws of the several States, and more rarely still by city ordinances.

A greater diversity of service is expected of the modern architect than of any other class of professional men. He must not only be skilled in construction and design; he must look after the financial interests of his client; he must act as arbitrator in disputes between the latter and the contractor; and he is expected to pass on every question of law that arises during his employment. All this wealth of learning, skill and business keenness is expected to be at his client's disposal without extra compensation; and it is not strange that oftentimes the architect gets weary and the client dissatisfied.

Probably none of the many problems which the nature of his calling and the oftentimes unreasonably exacting demands of his client throw upon the architect give him more trouble than the legal difficulties which surround all building operations. From the selection of the site and the drawing of the contracts and specifications to the payment of the last bill, or the termination of the last law-suit, questions are continually arising which demand some knowledge of the law. These cannot generally be referred to a lawyer, partly because the owner will not stand the expense, and partly because an accurate and ready answer to many of them would demand a more thorough familiarity with building methods than most lawyers possess. An acquaintance, therefore, with the rules of law applicable to building transactions is essential to the architect; but it is not such an easy thing to acquire. The law-books devoted to the subject are few in number, and totally inadequate in substance from the standpoint of both architect and lawyer; study of the building cases in the law-reports is laborious in the extreme, and altogether unlikely

to lead a layman to correct conclusions. Practically, therefore, the usual road to accurate knowledge of the law for builders, architects, and owners is the vexatious path of litigation.

It is not that the rules of law applicable to building operations are complicated or uncertain: they are, on the contrary, few and simple; but for this very reason, and because of their general character, they are usually taken for granted in the cases and books on building. It is, therefore, the more general works, the books on agency, on real property and on contracts, that the layman in search of building law must digest, and that is generally a task for which he has not time.

The characteristic feature of the English common law as distinguished from the jurisprudence of continental Europe, founded mainly on principles inherited from the days of the Roman law, is its freedom from special branches and special rules applicable to particular subjects only. The fundamental principles of the common law are extremely few, and they are of general application. There is, for instance, no "building law," strictly speaking; that is, there is no set of rules of special and peculiar application to buildings. There is no special law of party-walls, there being no such thing in our system of jurisprudence as a "party-wall," considered as a distinct species of property with special legal attributes. There is no law peculiar to architects as such; they have with us no definite legal status, as in France and other countries. An architect has, in our law, no authority whatever as such, and all his legal relations with his client are to be determined simply by the general rules of agency and contract. Thus the questions commonly put by architects to lawyers: "Can the architect do so and so?" "Has the architect authority to order such and such things?" are in that form incapable of being answered, for the extent of the architect's authority depends in every case upon the instructions which he has, in fact, received from his client.

A full appreciation of the fact that we have no special "building law," that the term itself, strictly speaking, is a misnomer, being simply a convenient designation for the group of cases in which the general rules of law have been applied to building contracts and kindred questions, is the first thing to be grasped by every one whose calling makes it important for him to become familiar with the principles of law which govern these matters.

An attempt will be made in this department to present in a concise form the legal principles which it is important for architects to know, and which, for the reasons given above, it is difficult for them to ascertain. It is hoped that this work, supplemented by answers to correspondents and by some discussion from the legal standpoint of other matters of general interest to architects, will meet with the approbation of our readers and of the profession generally.

COMMUNICATIONS.

COMBUSTIBLE ARCHITECTURE AGAIN.

BOSTON, MASS., January 22, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Under the title of "Church Vestry Destroyed," the Boston *Herald*, under the date of Monday, January 21, gives an account of the destruction of the vestry belonging to the old Cambridge Baptist Church, which was a large and expensive structure, purporting to be built of stone. The firemen on reaching the fire "found the whole roof of the vestry blazing," and with great difficulty the fire was prevented from penetrating the hollow roof and the hollow walls of the main church, which was barely saved.

The cause of the fire is said to have been a defective flue: this may be a very good guess, but one who has studied the frequent combustion of this class of buildings may venture to guess that during the variable weather of last week the furnace was lighted when the church was very cold, and when the outer air became warm, back action may have taken place through the furnace air-box, probably made of wood, setting the floor and hollow wall of the vestry on fire; the fire being immediately communicated to the roof, where there was a space of four feet between the ceiling and the roof proper.

A loss of twenty thousand dollars and four firemen injured is the price paid for this example of combustible architecture. I think this is the third instance of similar fires in Cambridgeport in recent years. In the previous case, a second church upon the same spot where the previous one had been burned, having been destroyed in the same way, I ventured to recommend, under the name of "Ignis Fatuus," that the Building Committee should advertise for a *safer* method of combustible architecture, which should ensure the very prompt combustion of the church itself without exposing the firemen to danger. Whether or not this plan was followed in the building of the church for the third time I am not informed.

I venture at this time, in the light of the fire, to send you three studies for slow-burning churches, houses and hospitals which may serve a useful purpose in calling the attention of the public to the usual faults in construction of this kind. These buildings are out of our customary line, but since we have been obliged to refuse to insure a Memorial Church, belonging to the owners of some very large cotton factories which we *did* insure — owing to its faulty construction — we thought it might not be inconsistent to give our members some hints, so that they might construct safe memorial churches, or other buildings appurtenant to their factories. We submit these sketches merely as studies, for what they are worth.

Yours very truly, EDWARD ATKINSON.

SUPERINTENDING WORK AT A DISTANCE.

SEATTLE, W. T., January 18, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I have a work to design and superintend, to cost $200,000. It is located at Seattle, W. T., while my home and business is in New York. I cannot give it personal supervision, and must leave the superintendence to a deputy. There is one of tried experience who offers his services at $2,400, a year. The price is moderate; he surely should be worth that if he is efficient for the service, while the payment — if so large a building is as long in construction as usual — will probably more than eat up the entire commission allowed me for supervision. This I should not at all object to, but here enters another feature: as my representative, I am responsible, minus all compensation for responsibility for him, and if — as in the case of a hotel at Kansas City, where I understand a truss at the top of the building slipped and landed in the cellar, causing several thousand dollars loss, and where combined with the contractor, the architects — though their plans were faultless, were held for the mishap because they were the superintendents — if, I say, such troubles should arise in my work, where would I stand? And what safeguard, if there is any, could I provide to eliminate this unjust element of risk?

It has seemed to me that the owners have a distinct right to look to me to perform for them all the duties of an architect; but ought not I also to have some provision by which I can sleep in security while my work is going forward?

Any suggestion that can help me to adjust this business on a proper and if possible, a safe professional basis, will be greatly appreciated by, Yours respectfully, VITRUVIUS.

[WE should say that "subscriber's" best way would be to furnish drawings and specifications for the building, receiving for them the usual commission for such limited service of three and one-half per cent, and have it understood that his responsibility ends then and there, the owner providing as he may see fit for the carrying out and supervision of the work. If the owner wishes to have the architect superintend the building, the only fair way would be to pay him for the time, as well as the money, expended in travelling to and from New York, the *frais de déplacement*, as the French law calls it. To expect the architect to keep a deputy on the ground, committing his fortune and his professional reputation absolutely to a stranger, simply because the owner does not wish to pay the reasonable cost of having the architect himself see to the work in which he has so heavy a responsibility, may seem right to an owner, but it hardly will to any one else; and an architect who would take so grave a risk deserves no sympathy from the profession. — EDS. AMERICAN ARCHITECT.]

PIPING A HOUSE FOR GAS.

NEW YORK, January 26, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — The complaint of "Sinex" is most interesting, and we hope it will provoke discussion. No part of the construction of a building, of equal expense, is more important, and none so universally neglected by both owners and architects, as the gas-fitting. During an experience of more than twenty-five years' gas-fitting, lighting many thousands of country buildings of all classes, we have hardly ever seen specifications furnished by either architect or owner which would furnish reasonable direction to the gas-fitter, or afford any protection to the owner.

We have men employed nearly all the time in taking out piping from houses imperfectly piped, and doing what may be done to rectify inferior work. During the last thirty days we have found three buildings in the suburbs of New York in such a condition that it was dangerous to turn the gas into them. Removing, at great expense and annoyance to the owner, oak floors and wainscoting, tearing off decorations, and in some instances removing clapboards from the outside of houses, we have found every rule of the trade violated — split pipe, fittings full of sand-holes, joints so loosely put together that they may be swung around by hand, pipe of insufficient capacity, drops taken out from the bottom of running lines, bracket-lights run from overhead instead of from below, and drips carrying a condensation into fixtures, instead of into risers and out of the house.

How may these difficulties be avoided?

First, let "Sinex" pay what the work is worth.

It is safe to say that no house to which even the smallest gas-machine made would be attached can be honestly piped for thirty dollars. No gas-fitter ought to consent to pipe any house for less than fifty dollars. In a matter of so much importance, and where the cost is so trifling, why should not the owner, selecting tradesmen of financial responsibility and known skill, order the gas-fitting done by the day? Why invite dishonest work by asking, in a general way, for bids from anybody and everybody, without providing, first, suitable specifications for the work, and, second, insisting on a certificate signed by an inspector known to be competent? We have furnished printed directions and specifications in detail for the piping

of suburban buildings suitable for gasolene-gas for many years, and have distributed thousands of them to architects and owners without charge, but have never in a single instance seen one of them used.

So long as owners and architects are so singularly and conspicuously indifferent to the character of work done, how can gas-fitters and plumbers be expected to care.

Probably "Sinex" got more than thirty dollars' worth of work in the case he complains of.

Gilbert & Barker Manufacturing Company.

THE CHURCH OF GAUDALUPE, MEXICO.

Hartford, Conn., January 22, 1880.

To the Editors of the American Architect:—

Dear Sirs,— Some of your readers may be interested to know that the massive frame surrounding the "miraculous" picture of the Virgin in the centre of the high altar of the church at Guadalupe, published in last issue, is of solid gold, and was given by a wealthy merchant who had been, it is alleged, benefited by the Virgin's interposition in his affairs.

The double balustrading reaching down from the altar to the organ in middle of nave is of solid silver.

The frame, I am not able to vouch for, but, while I was at the church a few months ago, the organ was undergoing partial removal and I inspected the railing, and found it cast hollow, with a shell one-quarter inch thick, apparently of pure silver throughout.

Silver is not dear in Mexico, and in the thin, dry air preserves its brilliant lustre a long time without repolishing.

In this church of Guadalupe are hung numerous effigies in silver of portions of human bodies which have been healed by the Virgin's miraculous powers. Yours very respectfully,

Melvin H. Hapgood.

NOTES & CLIPPINGS

A "Close Call."—One of the worst frightened men in Fall River, Mass., recently, was Alderman Durfee. He happened to be standing on a ledge of rock from which building stone was being quarried. Everything was quiet, but he finally noticed a man crawling towards him cautiously on his hands and knees. The alderman naturally inquired why this was being done, and was informed that for the past ten minutes he had been standing on top of a dynamite cartridge, and that the crawler had been trying to set it off by means of an electric wire. The alderman's heel was upon the wire and had grounded it, and that was the only reason why the blast did not go off. — *Fire and Water.*

Brick Foundations.—Mr. H. Leonard, M. I. C. E., the late chief engineer to the Bengal Public Works Department, gives in *Indian Engineering* an interesting account of experiments carried out by him at Akra with a view to determining the proper proportions of brick foundations in alluvial soil. The experiments were made on a large scale, the piers being of a size such as might be used in real work, and the indications obtained are correspondingly valuable. First, with regard to the pressure permissible, Mr. Leonard found that with a pressure of one ton per square foot on the soil there was practically no sinking, whilst with two tons the sinking was decided, and sufficient to cause bad cracks. If one part of a building were built with a pressure of two tons per square foot on the foundations, and another part with one ton only, the unequal settlement would be, he considers, quite sufficient to cause bad cracks; hence the load on the foundations should be under one ton per square foot, or if over should be equal on all the piers. Experiments were next made on the proper depth for the foundations. Trials were made with foundations at two feet, six inches, or just below the usually disturbed soil, at four feet where the true alluvial deposit was undisturbed, at eight feet where a different though not better soil was touched, and at eleven feet where the soil was soft and wet. The foundations at two feet six inches were found to be affected by heavy rains, whilst those at eleven feet sank more than those at four feet and eight feet, and Mr. Leonard finally concludes that in undisturbed alluvial soil the foundations of important buildings should be laid at a depth of between four feet and six feet. The third point examined was the proper spread to give the brickwork in such soil, and from these experiments he concludes that for a pressure of one ton to the square foot in Bengal soil the thickness at the toe of the slope should not be less than one foot six inches and the stepping at an angle of not more than forty-five degrees. — *Engineering.*

Flexible Foundations.—The ordinary conception of a foundation is that its virtue is in exact proportion to its rigidity, and that the more unyielding it is, the better it serves its purpose. And while this assumption may be true in supporting a heavy load, yet where questions of impact enter, the "soft answer will turn away wrath," as well in dynamics as in polemics. At a factory in the United States some bevelled gears which were used to change the direction of main shafting from one mill to another, were at the end of very heavy shafts, which ran in pillow blocks, simply bolted to an outcropping ledge, which was dressed to a level for the purpose of sustaining the foundations. Some of the teeth of these bevelled gears would break from time to time, and in a most unaccountable manner. The accident might be deferred for three months, or it might occur at any moment. Various expedients were tried, and finally that of taking up the pillar blocks and placing them on seats of raw hide which had been soaked in oil; these gave the bearings enough elasticity to prevent a concentration of shocks upon the teeth of the gear, and in that way acted as a buffer preventing the gears from committing a mechanical suicide. A steam engine, used to operate the dynamos for lighting an insurance building in New York, gave a great deal of annoyance to the occupants by the jar which was transmitted throughout the building. It is supposed that the motion of the engine was in rhythm with the key-note of the building. The makers of several engines tried to solve the problem, which was at last achieved by one firm, who bolted the bed of their engine to a timber raft which rested upon a layer of hair felt such as is used for non-conducting coverings for steam pipes and boilers, but fourteen inches thick. This felt was placed upon the masonry foundation recently prepared for the engine, and surrounded by a heavy timber box which prevented its spreading. An engine, used to operate the electric-light plant in one of the principal hotels in New York City, gave annoyance to the guests because, when it was in operation, beats could be heard all over the building, notwithstanding that the engine was situated in a tightly-closed room in the basement. After various other expedients had failed, the doors to this room were taken down and replaced by double thicknesses of carpet fixed upon the framework. This served to break up the rhythm in such a way that the sound was not heard throughout the building. Sawdust has been used for foundations in many instances, and there are numerous towns in the United States which have been built up from small villages originally around a sawmill, and the sawdust from the mill has been used to fill up low places which have afterwards served as building lots. In course of time such filling becomes very compact, and does not appear to waste by decay. — *Engineering.*

TRADE SURVEYS

The combination of electric-light interests which has been long under discussion, has been finally partially effected by the United States and the Westinghouse uniting. These companies will control some 700 patents and represent a capital of $10,000,000. The manufacturing capacity at present is 15,000 lamps per day, and new works will be erected at New York and Pittsburgh to expand production to any desired limit. This unification of interests is significant in many respects. It means, among other things, that a good many patents that have heretofore been unused will hereafter be developed, and that a great deal of work will be prosecuted which it was to the individual interest of the companies to hold in check. While this is in the form of a monopoly, it is one of those combinations which will naturally result in much good. It is probable that the cost of electric lighting will decline rather than increase. The reports from the leading companies all over the United States all speak of an unusually active condition of business. During the past ninety days more business for electric-light conveniences have been received and ordered, it is stated, than during any previous twelve months. Manufacturers of machinery of all sorts of equipments and supplies are now crowded with work, and this conditions of things is not likely to be changed by any decadence of demand for an indefinite period. The demand for electric-light goods from all sections of the country, from small towns in the far West and Southwest, as well as from the larger cities, is large. The activity in electrical circles is a fair sample of what is going on in many other directions. The projectors and promotors of industrial enterprises are entering upon their new work for the coming season. A resumé of the extensive operations projected during the past thirty days may be presented in the compass covering almost every kind of manufacturing enterprise. Throughout the South, cotton-mills, agricultural implement-works, wagon-factories, rolling-mills, blast-furnaces, besides innumerable small manufacturing establishments, are all projected for construction as soon as material can be had. Louisville will become quite a manufacturing city if all the schemes that are projected are carried out. Mississippi has already made wonderful progress, and several large companies are now preparing to operate in that State, in railroad construction, in the establishment of ship lines, in cotton-mills, in lumbering operations and in many others. A great deal of money will be invested in Northern Alaska this year, and four or five long lines will be constructed, the others of fifty miles in length.

Along the Atlantic coast numerous enterprises are talked of, most of them the property of Northern capitalists. Late advices from Kansas City, Omaha and Minnesota show that indications from these centres can be relied upon as general that there will be larger building operations undertaken this year than last. One reason is that last year's investments have been unusually profitable, another is that the country is filling these localities and that the country is being developed. Omaha is becoming a very important commercial centre and important railroad schemes will make that a sort of centre. Besides this, numerous small manufacturing enterprises are springing up in Montana, Colorado and Utah and they are drawing capital and enterprise in their wake. In Minnesota, St. Paul, Duluth and that region of country, those who will make investments as the railroad situation clears are waiting. The solution of the railroad question will erase a great many difficulties in the way of farmers, miners, lumbermen, and the copper-mining interests as well as the agricultural and commercial interests and the paper interests of this wonderful section. Not one single branch is threatened with restriction. Enlarging operations will probably be reported within ninety days in every branch. The leading lumber authorities are predicting an improving trade and are intending to prepare for it when it comes. In New York City there is a growing accumulation of money. The surplus there is now in excess of $20,000,000. This is an encouraging thing just now. Financiers are pleased at the manner in which borrowers are repaying their loans everywhere. Very few failures are taking place. The great bulk of obligations are being promptly met. Bankers find but little demand for money, yet it must be remembered that there is an increase in the amount of business that is being done by the use of negotiable paper. Business men are interested in keeping as near to the cash system as possible. Bankers themselves are disposed to favor an increased supply of money to meet the enlarging business operations, but they are not willing that it should be issued otherwise than under the supervision of banking interests whose business it is to measure the requirements of the country, so far as money is concerned and to meet that demand. The railroad question is generally gliding toward a quiet solution. Two or three meetings have been held within ten days and the serious obstacles which then taxed the patience and ingenuity of the most experienced railway managers for years past are now likely to be adjusted.

S. J. Parkhill & Co., Printers, Boston.

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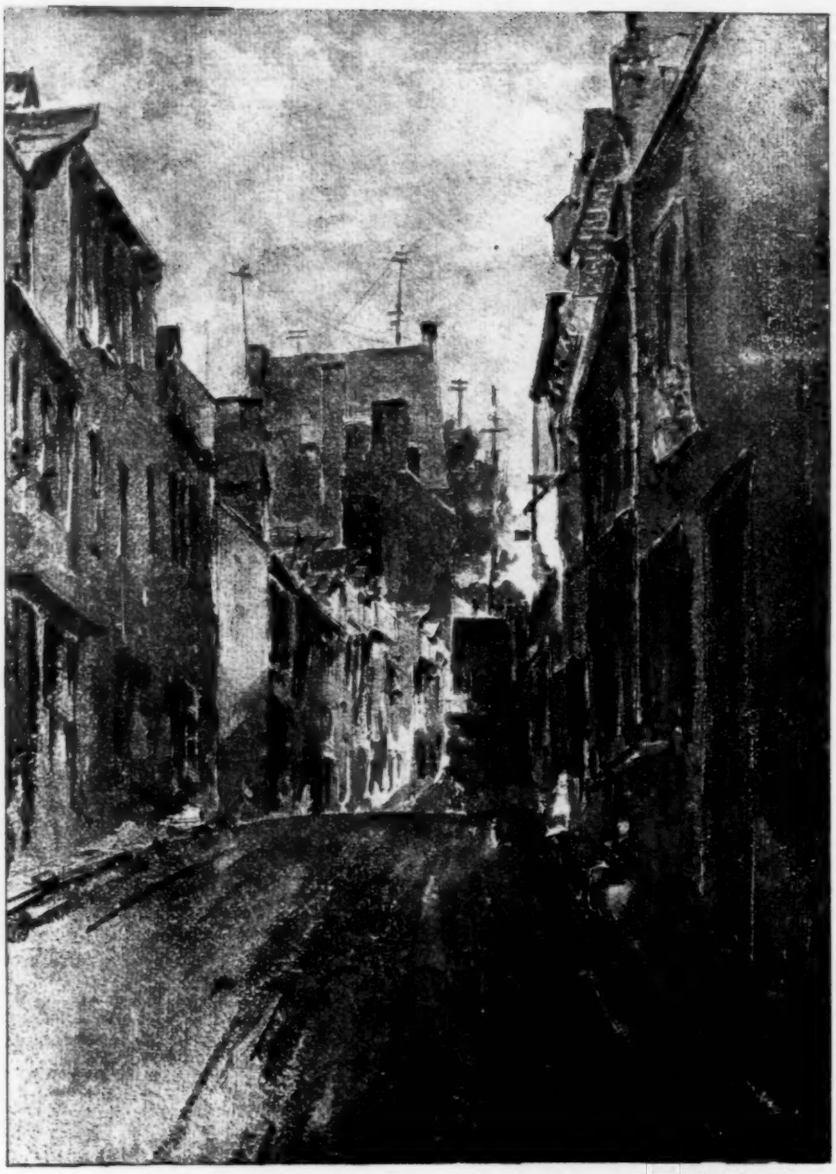

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A STREET IN QUEBEC, CANADA. SKETCHED BY R. BROWN JR. ARCH'T

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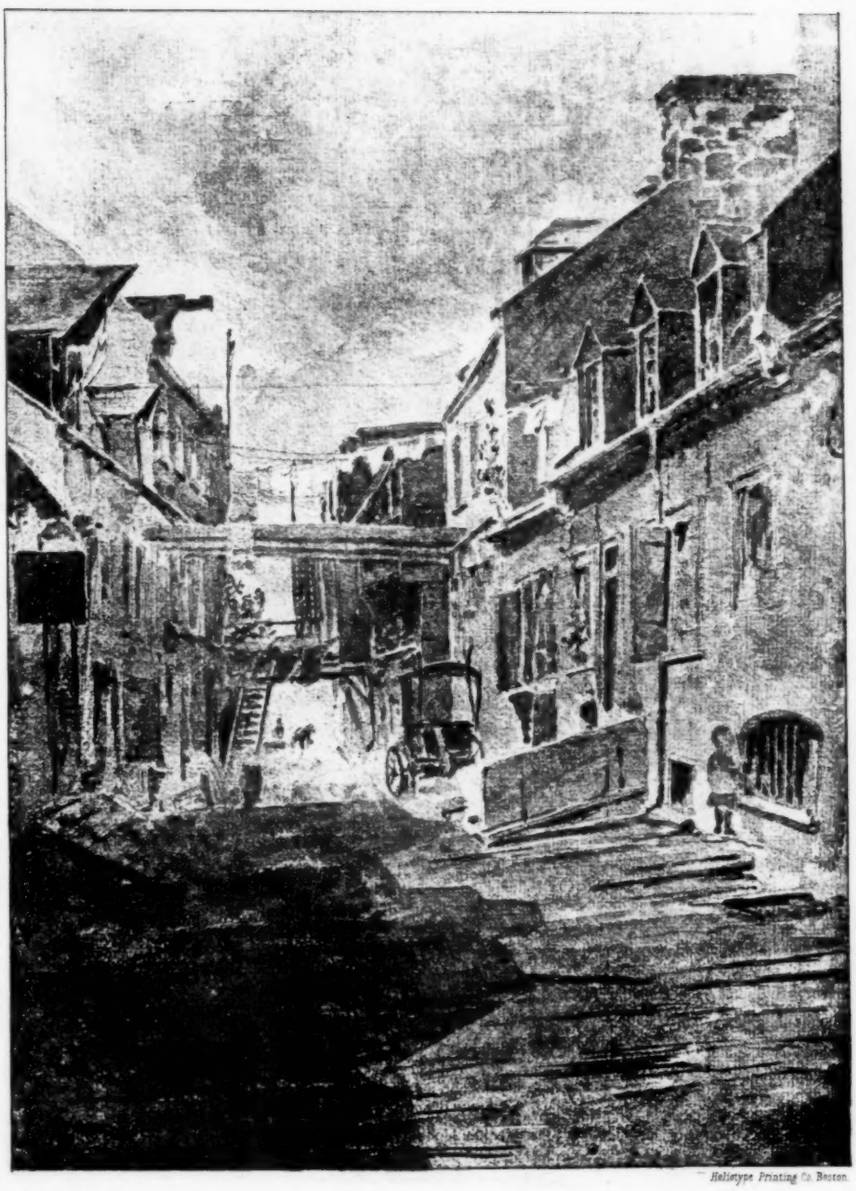

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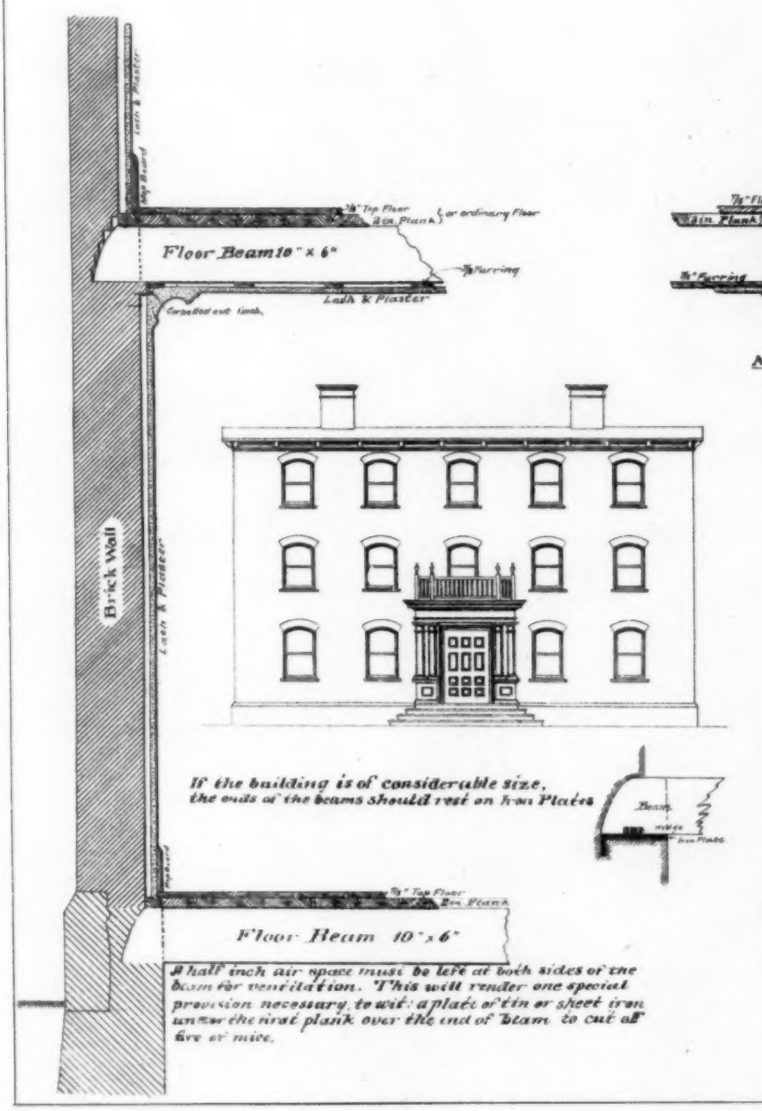
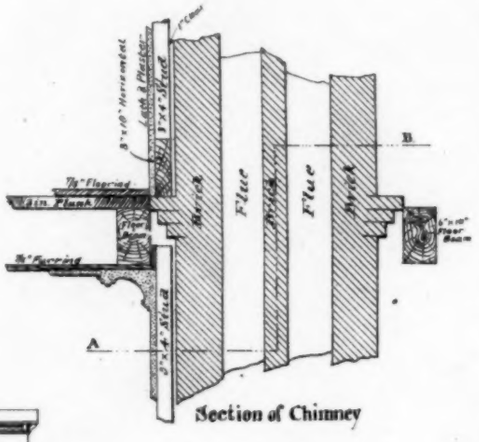
Associated Mutual Insurance Cos.

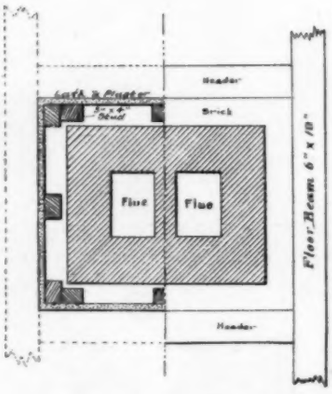
Plan for a Slow Burning Brick Hospital or Dwelling

Scale.


Floor Beam 10" x 6"
Brick Wall
Lath & Plaster
If the building is of considerable size, the ends of the beams should rest on Iron Plates
Floor Beam 10" x 6"
A half inch air space must be left at both sides of the beam for ventilation. This will render one special provision necessary, to wit: a plate of tin or sheet iron under the first plank over the end of beam to cut off fire or mice.



Section of Chimney



Horizontal Section at AB

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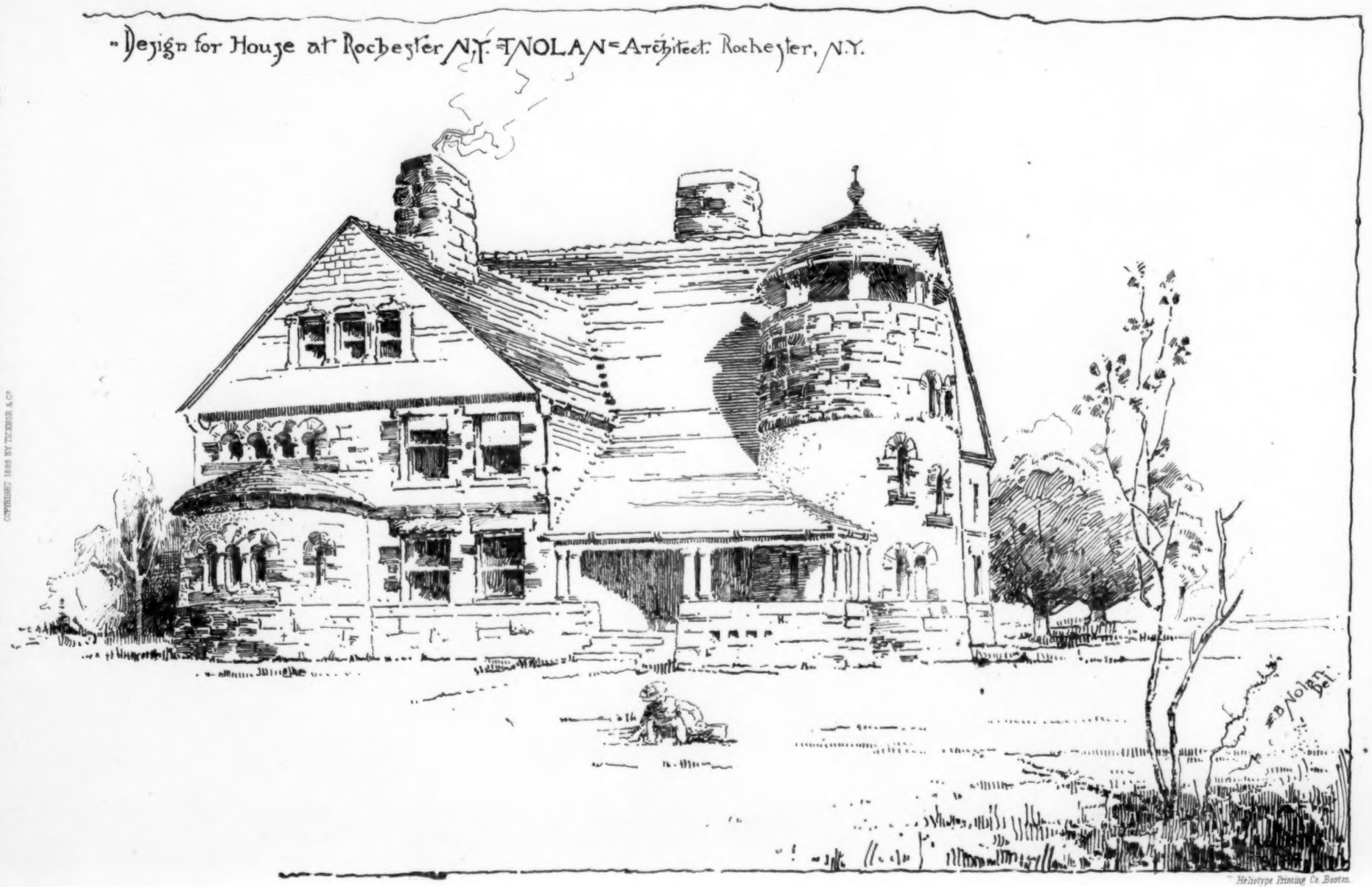
"Design for House at Rochester N.Y." NOLAN Architect. Rochester, N.Y.



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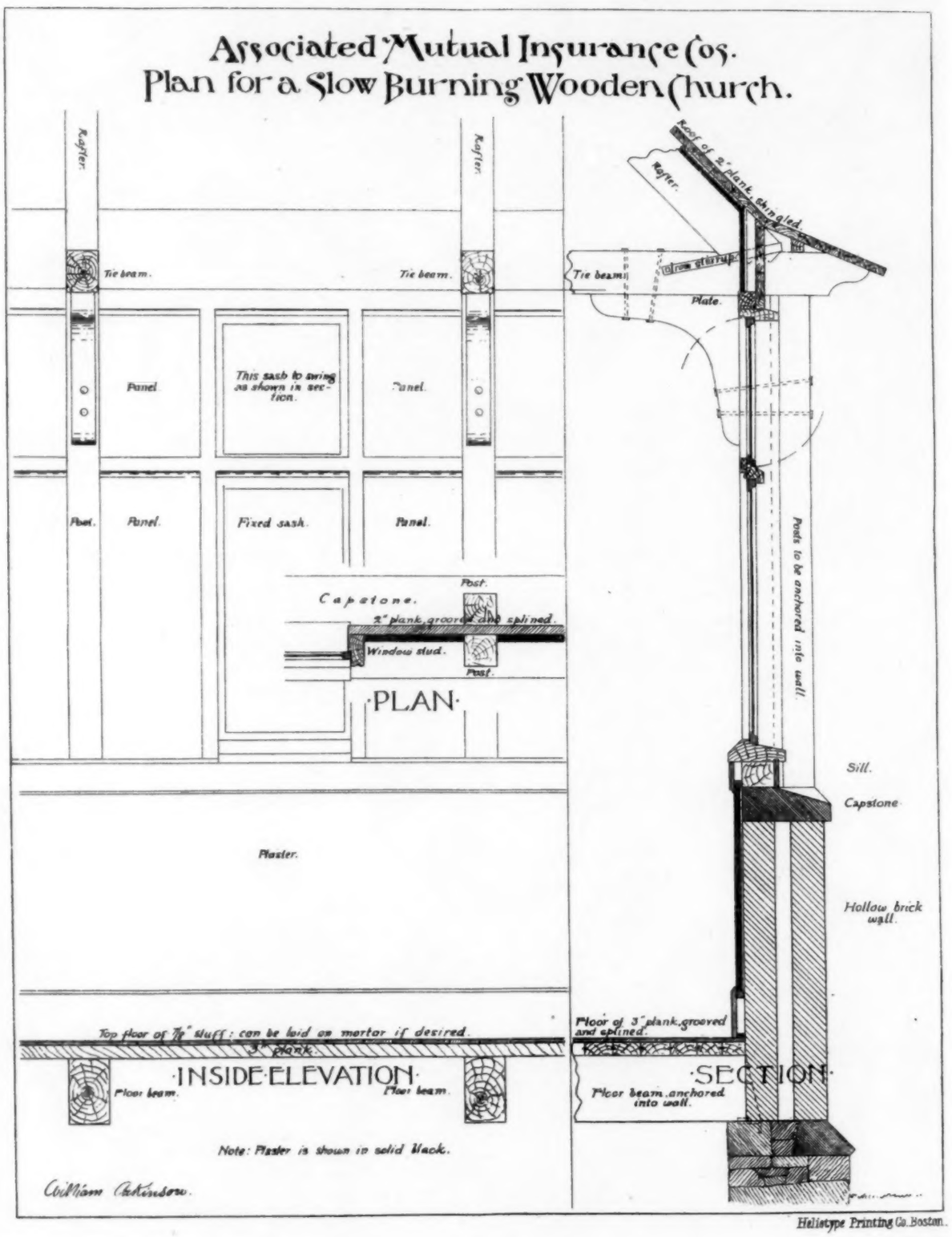
Associated Mutual Insurance Cos.
Plan for a Slow Burning Wooden Church.



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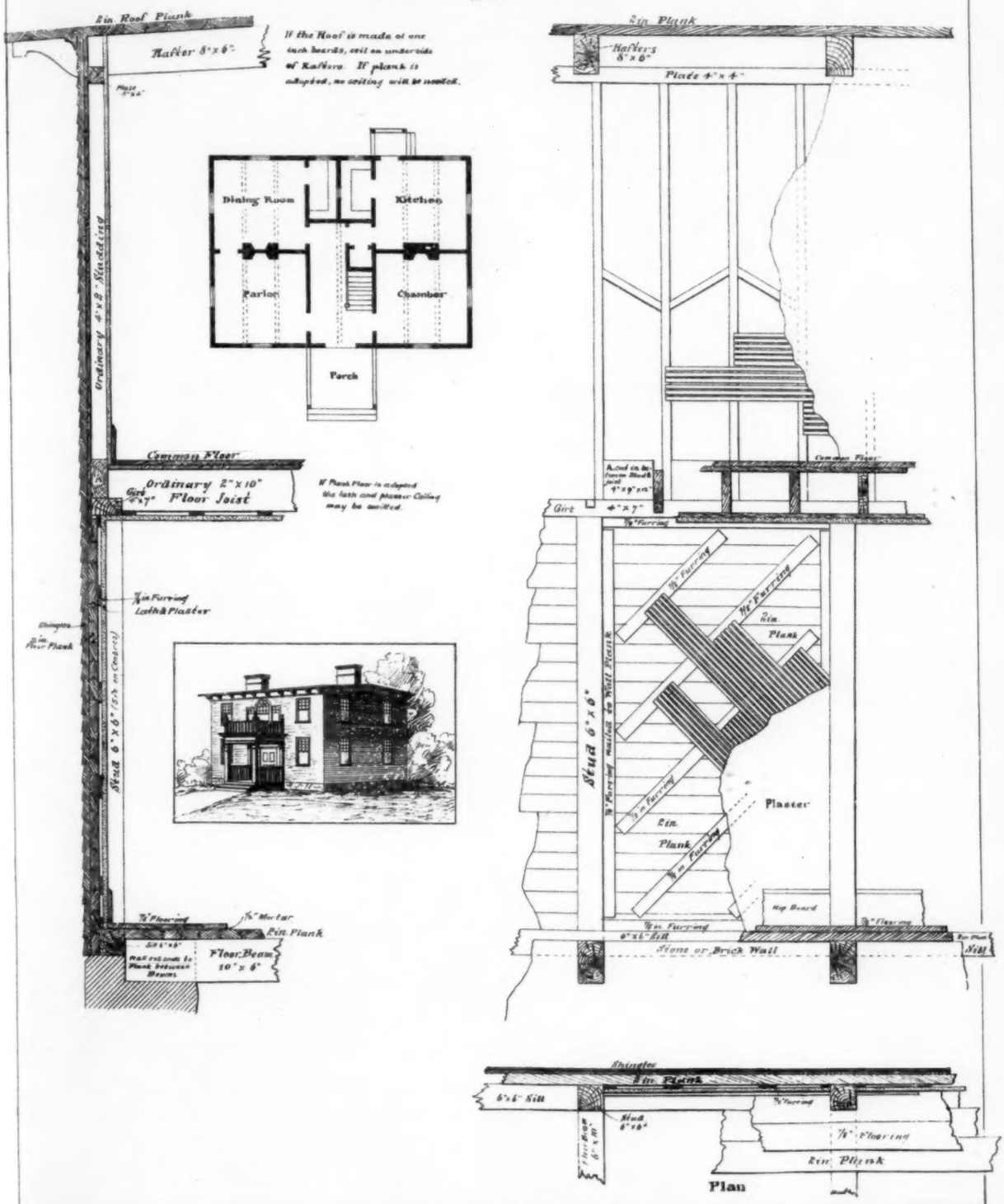
Associated Mutual Insurance Cos.
Plan for Building a Slow Burning Dwelling House.

Scale.



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